Alternatives Considered

2.1 Introduction

This chapter describes the alternatives and how they were developed for study in this Environmental Impact Statement (EIS). The alternatives described here meet the East Link Project purpose and need and include alternatives identified for further study as well as those eliminated from consideration. The evaluation processes that were used comply with guidelines of the National Environmental Policy Act (NEPA); the Washington State Environmental Policy Act (SEPA); and the Safe, Accountable, Flexible, and Efficient Transportation Equity Act—A Legacy for Users (SAFETEA-LU).

The proposed project consists of constructing and operating an approximately 18-mile light rail system known as East Link. This system would connect with Sound Transit's Central Link at the International District/Chinatown Station. It then would travel east across Lake Washington via Interstate 90 (I–90) to Mercer Island, Downtown Bellevue, and Bel-Red/Overlake, terminating in Downtown Redmond. Exhibit 2-1 shows the five segments of the project and the alternatives that are considered for detailed environmental review in this EIS. A No Build Alternative is also included to describe how the transportation system would operate if the proposed project were not built, thus serving to compare effects of the build alternatives.

The remainder of this chapter is organized into the following subsections:

2.2 Alternative Development and Public Scoping Process

2.3 Project Alternatives

2.4 Overview of Construction Approach

2.5 Environmental Commitments

2.6 Estimated Projects Costs and Funding

2.7 Next Steps and Schedule

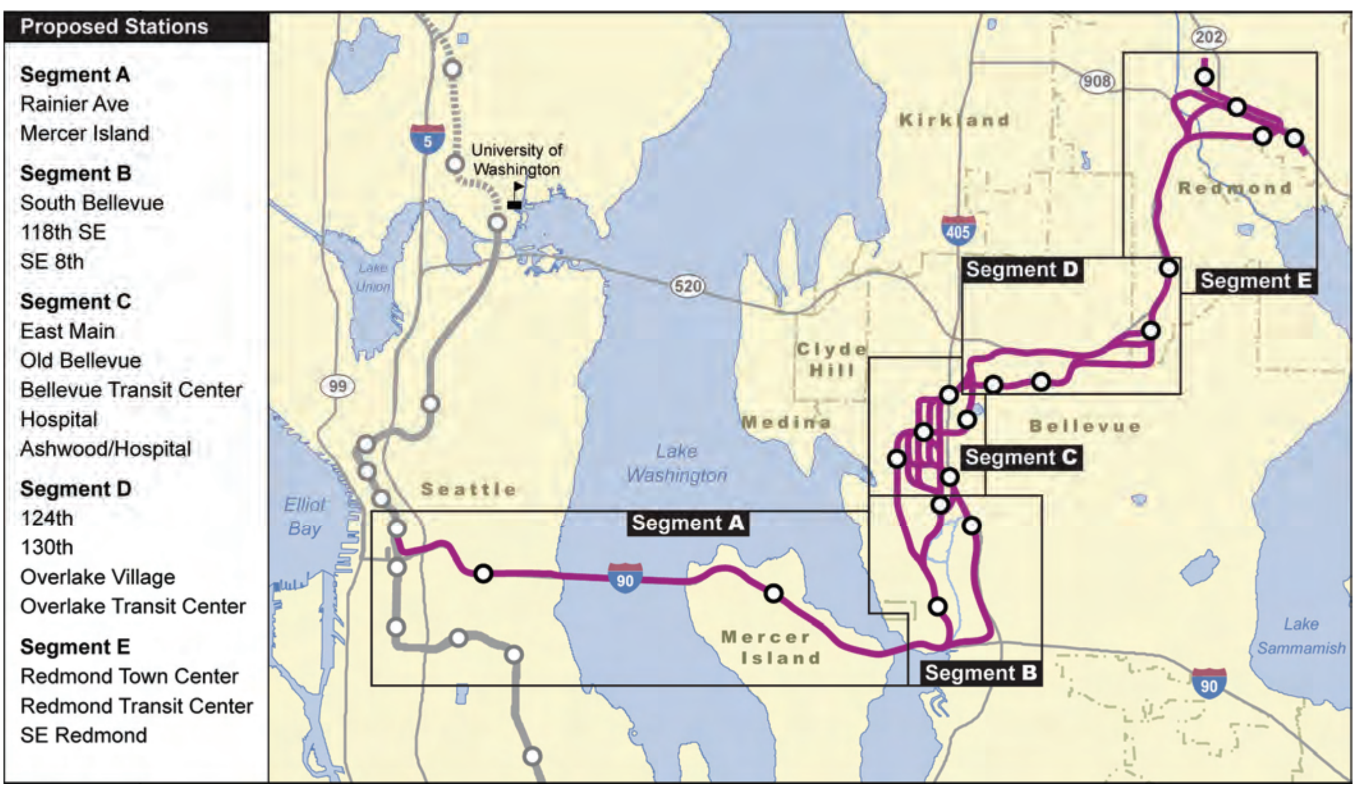


EXHIBIT 2-1
East Link Project Segments and Alternatives

2.2 Alternative Development and Public Scoping Process

As stated in Subsection 1.3 in Chapter 1 of this document, the East Link project and the alternatives considered in this document build on the conclusions of previous planning, studies and public involvement processes dating back to the mid-1960s. In particular, the Sound Transit Board made the following major decisions after extensive evaluation and review with agencies and the public before beginning this EIS process:

- Regional high-capacity transit (HCT) to the Eastside via I–90 is necessary.
- Light rail is the preferred high-capacity transit (HCT) technology for the I–90/East Corridor connecting Seattle, Mercer Island, Bellevue, Overlake, and Redmond.

Sound Transit's light rail alternatives development process for this Draft EIS included the following steps:

- Identifying feasible alternatives
- Obtaining scoping comments on alternatives
- Conducting a detailed evaluation of refined alternatives

For evaluation purposes, the East Link study area was divided into five segments along distinct geographic boundaries (see Exhibit 2-1). The five segments are as follows:

- **Segment A: Interstate-90**. Travels from the Downtown Seattle Transit Tunnel (where the East Link Project would connect to the Central Link light rail system currently under construction) to South Bellevue, where I–90 touches land in Bellevue.
- **Segment B: South Bellevue.** Travels from where I–90 touches land in Bellevue to SE 6th Street, including the south boundary of Surrey Downs Park.
- **Segment C: Downtown Bellevue**. Travels from SE 6th Street north to NE 12th Street, encompassing Downtown Bellevue and the area east of I-405 to the BNSF Railway corridor.
- **Segment D: Bel-Red/Overlake.** Travels from Downtown Bellevue (from the BNSF Railway corridor or NE 12th Street) to the Overlake Transit Center at the intersection of NE 40th Street and State Route 520 (SR 520).
- **Segment E: Downtown Redmond.** Travels from the Overlake Transit Center to Downtown Redmond, with two potential project terminus locations.

The alternative evaluation process was also informed by an Inter-Agency Team that included WSDOT; the U.S. Army Corps of Engineers; Federal Transportation Administration (FTA); FHWA; the cities of Seattle, Mercer Island, Bellevue, and Redmond; and King County. In addition, Sound Transit attended and presented information about East Link at neighborhood organizations, stakeholder gatherings, and, upon request, city council and other board meetings.

2.2.1 Criteria for Evaluation

The Sound Transit evaluation criteria were designed to satisfy the following project planning goals and supporting objectives as directed in the East Link Project purpose and need (see Chapter 1):

- Transportation goal: Improve transit mobility in the East Link corridor
  - Maximize East Link ridership
  - Improve the quality of transit service
  - Increase transit accessibility
- Environmental goal: Preserve environmental quality
  - Minimize potential adverse operating impacts on the natural and built environments
  - Minimize potential adverse construction impacts on the natural and built environments
- Land use goal: Support regional and local land use goals and objectives
  - Support adopted land use and transportation plans
- Implementation goal: Minimize risk
  - Design system to reduce construction risk
  - Enhance stakeholder and community support
- Provide a financially feasible solution
  - Build a system within project budget
  - Build a system that can be operated and maintained with available revenue
  - Build a system that is cost-effective

2.2.2 Identifying Alternatives

To identify the most promising alternatives to propose during the public scoping process, Sound Transit developed 35 preliminary alternatives for the East Corridor between Seattle and the East Link growth centers of Bellevue, Overlake, and Downtown Redmond. In developing the preliminary alternatives, Sound Transit reviewed past planning studies in the corridor and consulted with state, federal, and local agencies in the corridor.

Segment A evaluated only the I–90 Alternative. Of the 35 alternatives in Segments B through E, Sound Transit, in consultation with the Inter-Agency Team, eliminated nine alternatives based on the initial analysis because of ridership, cost, construction risk, and environmental impacts. Sound Transit recorded this process in *East Link Alternatives Evaluation Report, Seattle to Bellevue to Redmond* (Sound Transit, 2006c).

Sound Transit advanced 27 alternatives (including one alternative in Segment A) that warranted further evaluation. In addition, five potential maintenance facility locations were explored. Sound Transit summarized the results of the evaluation in *Sound Transit Board Briefing Book, Light Rail Alternatives* (Sound Transit, 2006b), which was presented to the Sound Transit Board and posted on the project website (www.soundtransit.org). In this evaluation, Sound Transit highlighted the results in the following five comparative areas for all the alternatives:

- **Ridership**. Ridership numbers are additional systemwide boardings from adding East Link to Central Link.
- **Environmental Impacts**. Comparative impacts were summarized for relocations and impacts associated with parks, historic properties, traffic, noise, visual resources, ecology, and removal of parking and lanes, as well as for construction disturbances on adjacent properties.
- **Markets Served.** Markets served are typically land use destinations for station placement among high concentrations of employees and/or residents.
- **Construction Risk**. Risks were compared against an average risk of geologic and utilities constraints.
- **Cost**. Costs were comparative, measured against the lowest cost alternative in each segment.

Five potential sites for the maintenance facility were identified using the criteria of compatible land use zoning, relatively flat areas of approximately 15 acres, and convenient access to the light rail vehicles and tracks. Four maintenance facility sites were identified in Segment D and one in Segment E.

2.2.3 NEPA and SEPA Scoping Process

The FTA and Sound Transit held a public scoping and comment period to officially initiate the NEPA and SEPA EIS process. The scoping period took place from September 1, 2006, to October 2, 2006. Sound Transit invited city and county agencies; affected tribes; regional, state, and federal agencies; interest groups; businesses; affected communities; individuals; and the public to comment during the scoping process. The following activities were undertaken in support of and during the scoping process:

- Identified alternatives for evaluation, environmental issues to be addressed, and opportunities for public involvement.
- Released the *Environmental Scoping Information Report* on September 1, 2006 (Sound Transit, 2006a), describing the alternatives, issues, draft Purpose and Need Statement, and the public involvement schedule. This report was available at the public open houses and the agency scoping meeting, and on the Sound Transit website.
- Sent postcards to over 154,000 residents and businesses along the corridor to announce the beginning of the scoping process, the public open houses, and the availability of the *Environmental Scoping Information Report*.
- Held four public scoping meetings—one each in Seattle, Mercer Island, Bellevue, and Redmond—to present project information and receive comments to help refine proposed alternatives, environmental issues, and the environmental process.
- Held one agency scoping meeting on September 12, 2006, to receive comments from interested and affected agencies.
- Met or corresponded with affected local, regional, state, and federal agencies, tribes, and other organizations about issues within their jurisdiction or concern.
- Received approximately 300 written and oral comments made at the scoping meetings or received during the scoping period, and, as appropriate, refined the proposed alternatives, issues, and public involvement program.
- Prepared a *Scoping Summary Report* (Sound Transit, 2006d) to summarize the results of the scoping process, including comments received, and made the report available to the public and posted it on the project website.

2.2.4 Alternatives Eliminated

After a review of evaluation results and public and agency comments, the Sound Transit Board in December 2006 identified the alternatives to be analyzed in this Draft EIS. Eight alternatives and one maintenance facility site were eliminated from further consideration as discussed in the following subsections.

Segment B

In Segment B, three alternatives were eliminated. Two eliminated alternatives traveled east along the south edge of Mercer Slough Nature Park and then turned north along the east boundary of the park adjacent to 118th Avenue SE. North of the park, the two alternatives diverged to follow different roadways. Sound Transit eliminated these alternatives because they would result in the highest environmental impacts along the Mercer Slough Nature Park and wetland areas, without providing any additional benefit above a remaining parallel alternative with lesser park impacts. The third alternative eliminated in Segment B had unnecessary out-of direction travel, resulting in higher costs and inefficiencies without higher ridership than other alternatives in Segment B. This alternative traveled east, across the south edge of the Mercer Slough Nature Park, paralleling north of I-90, and turned north inside the BNSF Railway. It transitioned to parallel I-405 where the BNSF Railway continues east across I-405. At SE 8th Street, this alternative returned west to 112th Avenue SE, where it continued north.

Segment C

In Segment C, two alternatives were eliminated because of lack of right-of-way availability at NE 7th Street. One alternative traveled along 110th Avenue NE and turned to cross over I-405 at approximately NE 7th Street, where there was thought to be adequate separation between the Meydenbauer Center and a new high-rise development. The other followed 112th Avenue NE, transitioned to 110th Avenue NE via NE 4th Street before turning east at NE 7th Street.

Segment D

Two alternatives in Segment D were found to result in excessive impacts along Bel-Red Road. One alternative traveled the length of Bel-Red Road from 124th Avenue NE to 152nd Avenue NE. The other traveled along NE 16th Street, a new planned roadway, then merged onto Bel-Red Road at 140th Avenue NE and continued to 152nd Avenue NE. Placing light rail in the median and widening the Bel-Red Avenue roadway would result in higher impacts on adjacent uses and greater construction and other environmental impacts. None of the remaining alternatives travel along Bel-Red Road.

Segment E

Only one alternative was eliminated in Segment E. Segment E alternatives diverge from the same route at the SR 520 interchange with Lake Sammamish Parkway. The alternative that was eliminated followed the south side of Bear Creek Parkway and traveled along several minor arterials up to the Bear Creek Park-and-Ride Lot. This alternative was eliminated because it proved to have above-average impacts on ecosystems, parks, and traffic compared to other alternatives in Segment E. In addition, the Bear Creek Park-and-Ride Lot location presents circulation and accessibility constraints for adding a large terminus parking garage.

Maintenance Facilities

Five maintenance facility sites were considered, and only one was eliminated. This maintenance facility was located near 136th Street NE in Segment D. The location would have high environmental impacts and would limit transit-oriented development potential near a potential station.

2.3 Project Alternatives

Following the alternative evaluation process, a No Build Alternative, 19 build alternatives, and 4 maintenance facility alternatives were carried forward for analysis in this Draft EIS. This section describes each of these alternatives and the key project components that help to understand the alternatives.

2.3.1 No Build Alternative

The No Build Alternative represents the transportation system and environment as they would exist without the proposed project. The No Build Alternative provides a baseline condition for comparing impacts of the build alternatives and includes two future transportation forecast years, 2020 and 2030.

The No Build Alternative includes a variety of projects, funding packages, and proposals in the central Puget Sound region. The projects primarily consist of funded or committed roadway and transit actions by the state, regional, and local agencies combined with other projects that are considered likely to be implemented based on approval and committed funding. The No Build Alternative includes completion of the express bus, HOV, and Transportation System Management projects described in Sound Move (Sound Transit, 1996) and also include the Rapid Ride and other transit enhancements in the King County *TransitNow Program* (King County Metro, 2006).

Table 2-1 summarizes roadway and transit projects that have been incorporated into the No Build Alternative. The *Transportation Technical Report* found in Appendix H1 provides a detailed list of assumed major projects as part of this alternative.

For the transportation analysis in this Draft EIS, there are two No Build Alternatives related to implementation of the I–90 Two Way Transit and HOV Operations Project (also referred to as the R-8A Project). The two variations in the No Build Alternative lie in the implementation of the I–90 Two Way Transit and HOV Operations Project between Bellevue, Mercer Island, and Seattle. Exhibit 2-2 illustrates how implementation of the I–90 Two Way Transit and HOV Operations Project has been separated into three stages for funding purposes and describes what is included in each phase.

The East Link Project would require dedication of the I-90 center roadway for light rail use as stipulated in the 1976 Memorandum Agreement (as amended in 2004) among Seattle, Mercer Island, Bellevue, King County Metro, and WSDOT. Today, the reversible center roadway is dedicated as HOV lanes traveling in the peak direction (Exhibit 2-3), and the outer roadways are general-purpose lanes. HOV lanes are being built on the outer roadways in a three-stage project known as the I-90 Two Way Transit and HOV Operations Project (Exhibit 2-4) so HOVs can travel in both directions any time of the day.

Funding for Stage 3 of the I-90 Two Way Transit and HOV Operations Project is included in the Sound Transit 2 (ST2) Plan. With the Plan approved, Sound Transit intends to work with WSDOT to complete Stage 3 and then close the center roadway for light rail conversion. In other words, the center roadway may close for construction of the light rail project immediately after the HOV lanes on the outer roadway are completed, and the new HOV lines in the outer roadway would never operate in conjunction with the center roadway before construction of East Link. As a result, the No Build Alternative was analyzed with and without Stage 3 completion. Without Stage 3, HOV and transit travel between Mercer Island and Seattle would be restricted to the center reversible lanes in the peak direction only (i.e., westbound in the morning and eastbound in the evening). If Stage 3 is implemented and operates in conjunction with the center roadway before construction of East Link begins, both outer lanes of I-90 and the center reversible lanes would be available to transit and HOV. This variation in the lane configuration would only influence vehicle movements on I-90 and connecting transportation facilities.

2.3.2 Build Alternatives

Light rail is a conventional term for urban electric rail systems that have the flexibility to operate along an exclusive right-of-way at ground level, on elevated structures, in subways, or in streets. Sound Transit plans for light rail consist of electrically powered, low-floor, low-platform trains of up to four cars (totaling approximately 360 feet long) running on steel rails. The vehicles can carry as many as 200 passengers per car in the typical light rail car shown in Exhibit 2-5. East Link light rail operates at speeds up to 55 miles per hour (mph) in a dedicated right-of-way, and is generally not constrained by congestion or accidents. The dedicated right-of-way may be in public roadway or in existing railroad or acquired right-of-way.

The build alternatives are made up of a range of light rail routes and stations, with and without adjoining park-and-ride facilities. Maintenance facility alternatives are evaluated separately from the alternative routes and stations. Each of the build alternatives is designed as a double-track rail system to accommodate planned project operational needs for uninterrupted light rail movement. The entire East Link Project would vary between 17 and 19 miles, with a range of 11 to 14 stations depending on how the alternatives are combined.

This section describes the alternative routes and stations by segment. The alternatives have been developed to a conceptual engineering level of design (i.e., approximately 5 percent). Section 2.3.3 describes the maintenance facilities. Detailed drawings are included in Appendix G1, Conceptual Design Drawings, of the Draft EIS.

2.3.2.1 Components of Alternatives

This section describes key components, such as the rail and station profile, to assist the reader in the understanding the alternatives. Other aspects of the project, including capital equipment and project operations, are described in Section 2.4.

The proposed route and station alternatives vary in profile as traveling at-grade (sometimes a retained cut), in an elevated configuration, or in a tunnel. Maximum allowable grades are typically 5 to 6 percent for light rail. Because of the conditions along the corridor, the light rail project is largely elevated or at-grade; however, tunnel alternatives were also considered in Downtown Bellevue (Segment C).

TABLE 2-1
Components of No Build Alternative

Project/Program	Horizon Year 2020	Horizon Year 2030	Comments
Roadway			
Nickel Funding Package	X	X	Approved 2003
Transportation Partnership Funding Package	X	X	Approved 2005
I-90 Two Way Transit and HOV Operations Project	X	X	Stages 1 and 2, and with and without Stage 3 (see Exhibit 2-2)
Local Agencies			
Capital Improvement Plans (CIPs)	X	X	Typically 6-year funding commitments
Transportation Facility Plans		X	Typically 15- to 20-year list of funded and unfunded projects; funded projects included as part of CIP
Puget Sound Regional Council			
Destination 2030		X	Selected projects included
Transit			
Sound Transit			
Sound Move Program	X	X	Approved 1996
ST2 Program	X[a]	X	Approved November 2008. The package of projects is projected to be built over the next 15 years
King County Metro			
6-year Service Implementation Plans	X	X	
Transit Service Integration Plan	X	X	Prepared for East Link Project
Transit Now Plan	X	X	Approved 2006

[a] Not all projects identified in this program are expected to be built by 2020. The *Transportation Technical Report* in Appendix H1 contains the project list by horizon year.

EXHIBIT 2-2
Stages for Implementation of I-90 Two-Way Transit and HOV Operations Project Alternative

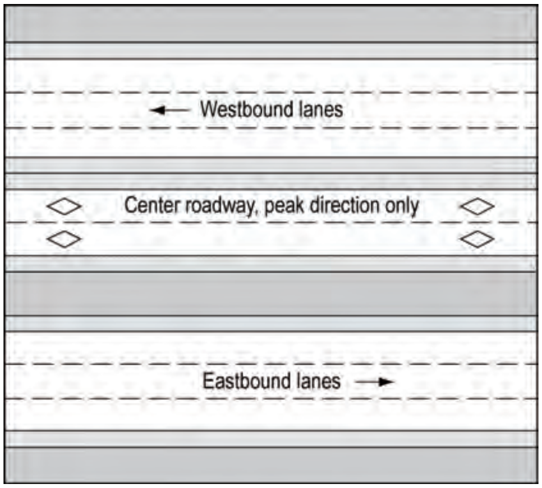


EXHIBIT 2-3
I-90 Existing Conditions and No Build Alternative with I-90 Two Way Transit and HOV Operations Project Stages 1 and 2 only

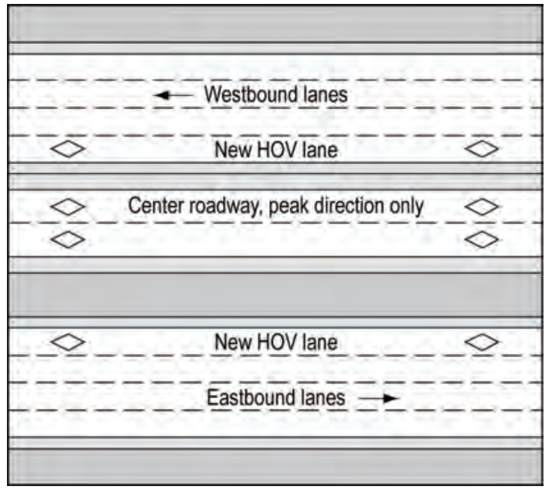


EXHIBIT 2-4
I-90 No Build Alternative with I-90 Two-Way Transit and HOV Operations Project Stages 1-3

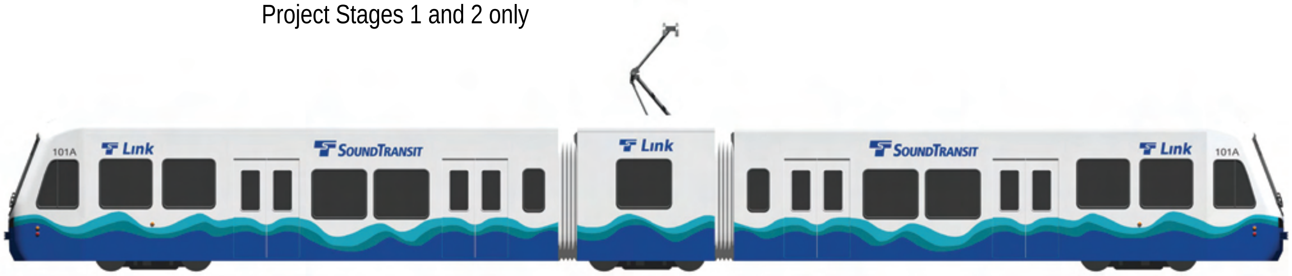


EXHIBIT 2-5
Typical Light Rail Car

At-grade operation is typically less costly, although each profile type has usefulness, as discussed in the following subsections.

At-Grade Profile

Light rail operating at-grade is best suited in areas where the grade is 5 to 6 percent or less and there is adequate room within reserved street rights-of-way or off-street corridors. At-grade operation works well with a moderate number of riders and train frequencies as often as every 4 minutes. Where located within a street right-of-way, East Link at-grade routes travel either in the median or along the side of existing roadways (Exhibit 2-6) and operate through intersections with advance signal detection and prioritization using a system of prioritized signalized intersections.

Retained Cuts

A variation of the at-grade profile is a retained cut, where the trackway is cut into the ground with a retaining wall on one or both sides (Exhibit 2-7). Portions of the routes may involve retained cuts to meet train operation grade requirements or to separate the grade under heavily traveled roadways.

Elevated Profile

Light rail on elevated structures works well where the system must be grade separated to cross over geographic or physical barriers and accommodate higher train frequencies, and where at-grade trackway may not be appropriate for a surface corridor. Transitions between at-grade and elevated profiles are typically compacted fill support. An elevated profile must have a minimum clearance of about 18 feet near roadways, but topography and other consideration may result in a profile as high as 50 feet or more. Pier supports are typically approximately 10 feet by 10 feet square at the ground, although the support structure below the ground may be wider. Just as for at-grade routes, the elevated guideway can travel either in the median of existing roadways (Exhibit 2-8), along the side of the roadway (Exhibit 2-9), or in off-street corridors.

Tunnels

Tunnels may be used where slopes are steep (more than 5 to 6 percent), physical barriers must be crossed, right-of-way is inadequate for at-grade or elevated profiles, the density of homes and businesses is high, and/or ridership and resulting train frequencies would be so high as to make street-level operations impractical. They are also appropriate where major ridership areas cannot be served in another way. There are substantially greater costs and risks with building tunnels. The two most common construction methods are cut-and-cover or bored tunnels. Cut and cover construction is built from the surface while bored (or mined) tunnels are constructed with no surface disturbance beyond entering and exiting the tunnel portals. The bored method is typically the most expensive. A cut-and-cover box and bored tunnel are shown in Exhibits 2-10 and 2-11.

Stations

Stations are designed according to the profile of the alternative. Depending on the location, stations can be designed with center or side platforms. Center platforms allow passengers to access trains going in opposite directions from the same platform. Side platforms, much like a sidewalk on either side of a roadway, require the passenger to cross over or under the tracks to access trains in the opposite direction. A station is typically 400 feet long to accommodate a four-car train, but it varies in width depending on the location of the platform and the profile.

East Link stations would include pedestrian, bicycle, and paratransit access, and bus access (with one exception). In some cases, automotive access including park-and-ride lots would be provided. Exhibit 2-12 illustrates four typical station designs: at-grade, elevated side platform, elevated center platform, and a tunnel station. The size of each station is determined by the site-specific access and parking requirements.

At-grade stations would have passenger access walkways and ramps. Any elevated or tunnel station would be furnished with stairs, elevators, and, in some cases, escalators. Each station would have ticket vending machines, closed-circuit television, public address, emergency phones, and variable message signage. Additionally, tunnel stations would have systems that monitor and control ventilation and fire/life/safety functions.

2.3.2.2 Description of Alternatives

The route and station alternatives are described below, and their characteristics are summarized in Tables 2-2 and 2-3. Exhibits 2-13 to 2-17 show the alternatives by segment. The four maintenance facility alternative sites located in Segments D and E are described in Section 2.3.3 and in Exhibits 2-16 and 2-17.

The alternatives are designated by either two or three characters: the segment letter (A, B, C, D, E), the number of the alternative, and, sometimes, a descriptive indicator consisting of A for at-grade, E for elevated, or T for tunnel. A break in the numeric sequencing for the alternatives indicates that a previous alternative was eliminated in the alternative development process (see Section 2.2.4.4). The types of tunnels for each alternative are discussed in Section 2.4.5. Stations are listed in the following alternative descriptions, and summarized in Table 2-3.

Segment A: Interstate 90

This segment has one alternative, the **I–90 Alternative (A1)**, which crosses Lake Washington and connects Seattle and Mercer Island with Segment B, South Bellevue. This alternative has two stations, one in Seattle and one on Mercer Island.

The I–90 Alternative (A1) begins in the Downtown Seattle Transit Tunnel at the International District/Chinatown Station where it connects to the Central Link light rail system currently under construction. From there, the alternative enters the D2 Bridge and Roadway. The D2 Roadway is a ramp between Downtown Seattle and Rainier Avenue providing HOV access to I–90. Two potential operational scenarios exist for this section of the D2 ramp: either the roadway would operate as a joint light rail/bus facility with embedded track, or it would contain light rail exclusively. The existing Rainier Avenue bus flyer stop would remain on I–90 for either scenario.

The alternative proceeds in the I–90 center roadway to the Rainier Station east of the existing Rainer Valley Bus Stop, passes through the Mount Baker Tunnel, travels in an exclusive right-of-way in the center roadway on the floating bridge, and continues to the Mercer Island Station located between 77th Avenue SE and 80th Avenue SE by the existing Mercer Island Park-and-Ride Lot (See Exhibit 2-18 for plan view of East Link on the I-90 Bridge). Pedestrian access is either from both 77th Avenue and 80th Avenue SE, or there is an option to construct access from 80th Avenue SE with a new pedestrian bridge over the eastbound lanes of I–90 to the station with direct connection from the Mercer Island Sculpture Garden and Town Center Shopping district (approximately 78th Avenue SE). A portion of the center roadway on the floating bridge would be dedicated to a WSDOT maintenance road to allow continued access to the bridge pontoon hatches. At both stations, the light rail remains in the I–90 center lanes, with pedestrian access from local streets. Both the I-90 tunnels and the floating bridge would require modifications to incorporate light rail. Modifications would include changes to wall dividers, drainage, and ventilation. To equalize weight on the bridge from installation of steel rail, the concrete surface may be made thinner by removing the upper layers. Finally, to accommodate

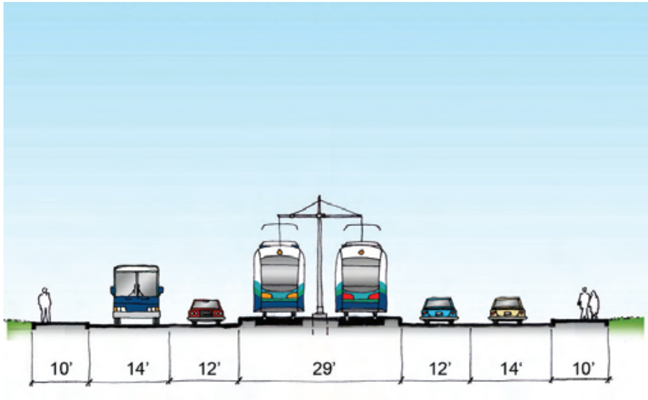


EXHIBIT 2-6
At-Grade Center-Running

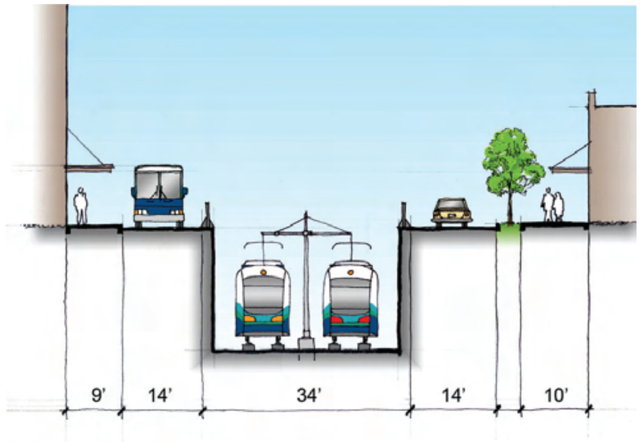


EXHIBIT 2-7
Retained Cut

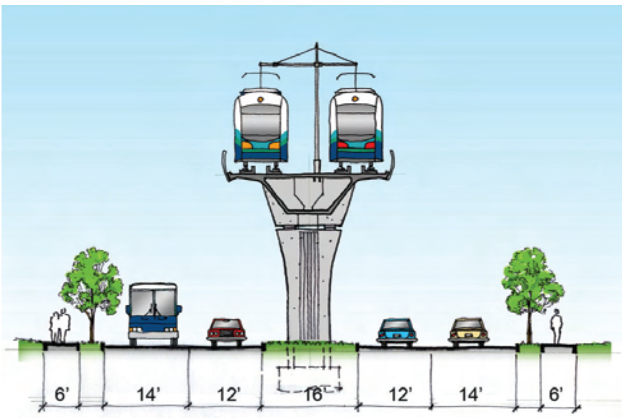


EXHIBIT 2-8
Elevated Center-Running

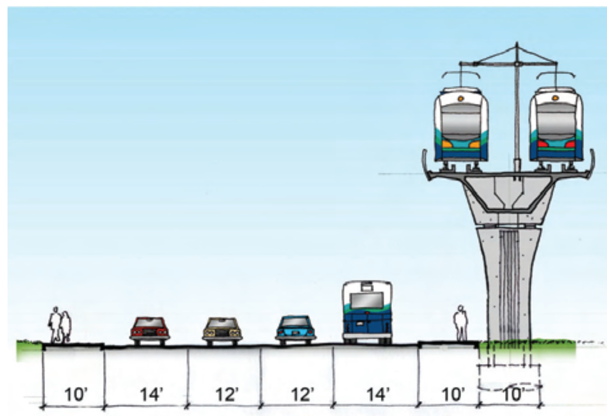


EXHIBIT 2-9
Elevated Side-Running

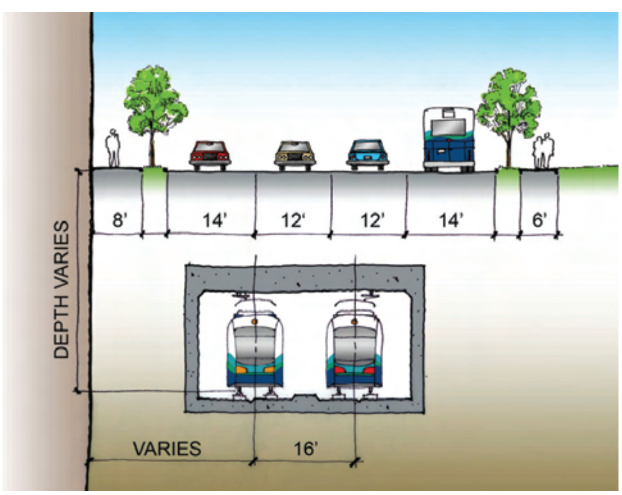


EXHIBIT 2-10
Cut-and-Cover Tunnel

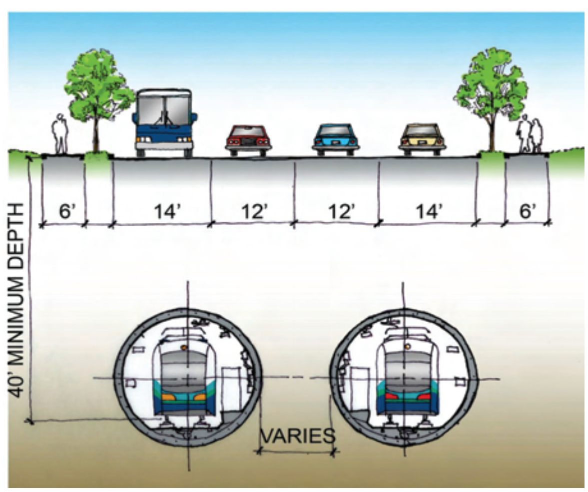
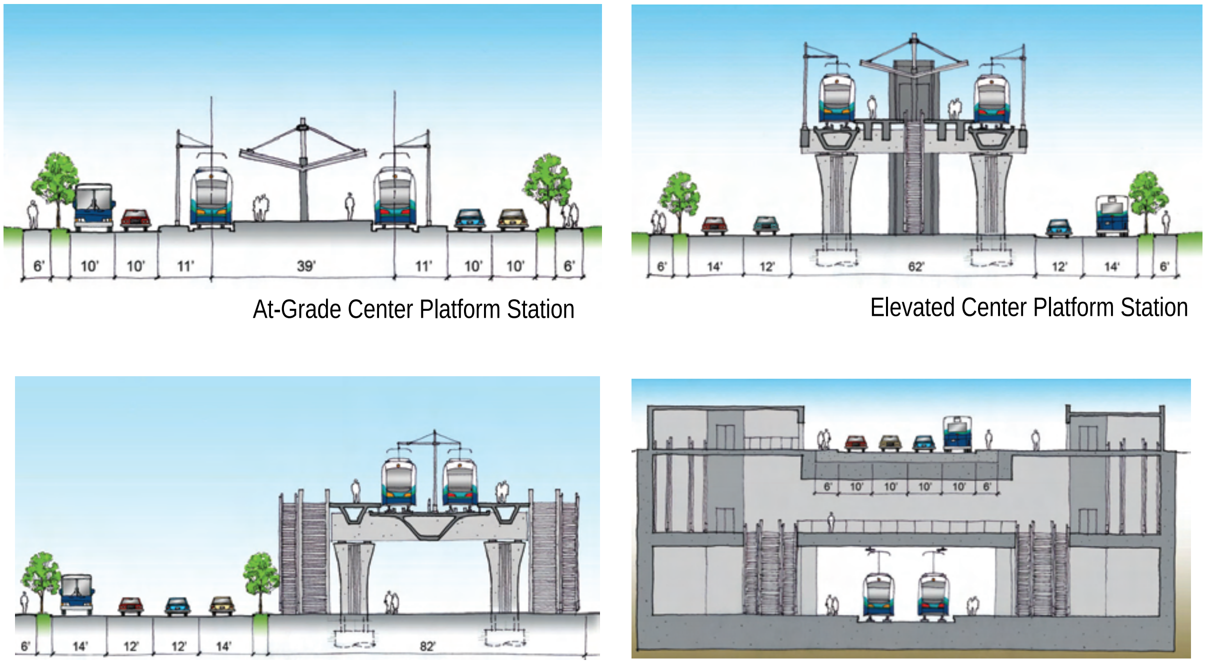


EXHIBIT 2-11
Bored Tunnel



At-Grade Center Platform Station

Elevated Center Platform Station

Elevated Side Platform Station

Side Platform Tunnel Station

EXHIBIT 2-12
Typical Station Designs

movement of the floating bridge in relation to the land abutment, a specialized rail expansion joint would be installed on the bridge.

From the Mercer Island Station to Segment B, A1 continues along the I–90 center roadway in exclusive right-of-way. The conversion of the center roadway to light rail would require closure of the westbound 77th Avenue SE off-ramp and the eastbound direct HOV off-ramp to Island Crest Way.

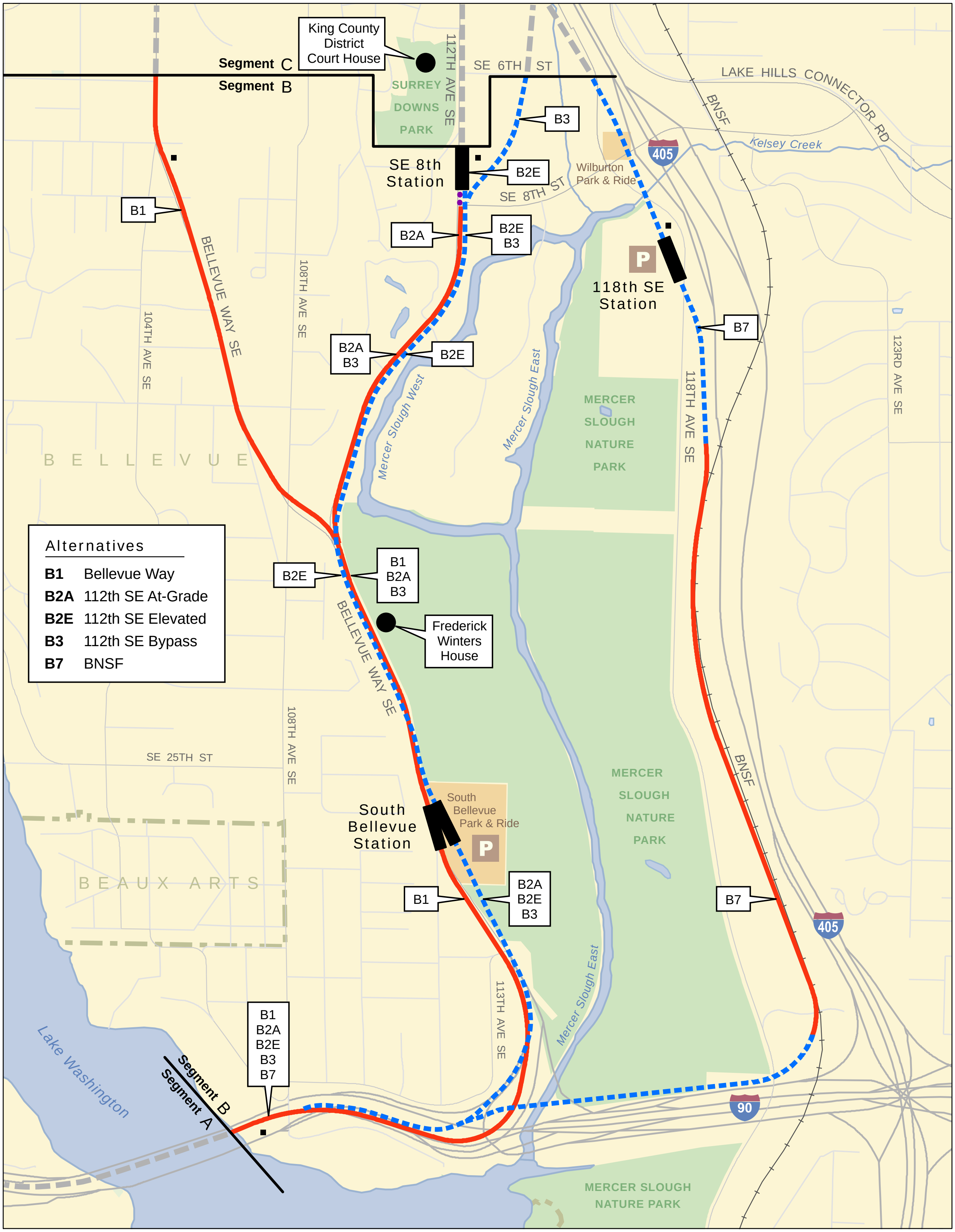
Two traction power substations would be located under the floating bridge: one near South Day Street in Seattle, and one where the bridge touches down on Mercer Island (see Exhibit 2-13).

I-90 Floating Bridge Design Considerations. Alternative A1 has several design considerations regarding the compatibility of light rail with the I-90 floating bridge. The Washington State Legislature Joint Transportation Committee commissioned an independent review team (IRT) to evaluate the bridge analysis. The IRT concluded that all issues identified as potentially affecting feasibility can be addressed. Specific concerns involve the expansion joints on the transition span between the approach bridges and the floating bridge, the additional weight of rail and trains on the bridge pontoons, stray electrical currents, seismic upgrades, installation of light rail components on the bridge, and bridge maintenance changes.

Expansion Joints. The I-90 floating bridge includes land-based fixed spans attached to the floating mid-section of the bridge. The existing traffic expansion joint between the fixed and floating portions of the bridge allows for bridge movement, and the new light rail expansion joint would need to accommodate this movement also. Because this would be the first known example of rail operation on a floating bridge, Sound Transit compared the anticipated movement on the I-90 bridge with the movements of modern passenger rail suspension bridges. This comparison demonstrates that it is feasible to design a light rail track system to accommodate the movements of the I-90 floating bridge. Sound Transit developed a conceptual design for the track expansion joints and will further develop plans for early final design and prototyping of the joint, with continued coordination with WSDOT during the design.

Additional East Link Weight. Load testing was conducted by WSDOT and Sound Transit in September 2005. Results of the load test confirmed previous findings that the bridge can be structurally retrofitted to carry the loads associated with the light rail system in addition to general traffic on the

Exhibit 2-13
Segment A, Interstate 90
Alternative A1
East Link Project



Source: City of Bellevue (2005) and King County (2006).

- At-Grade Route
- Elevated Route
- Retained-Cut Route
- Tunnel Route
- Adjacent Segment
- Traction Power Substation
- Station
- P New and/or Expanded Park-and-Ride Lot
- A | B Segment Limit

N

SCALE
0 0.125 0.25 Mile

Exhibit 2-14
Segment B, South Bellevue Alternatives
East Link Project

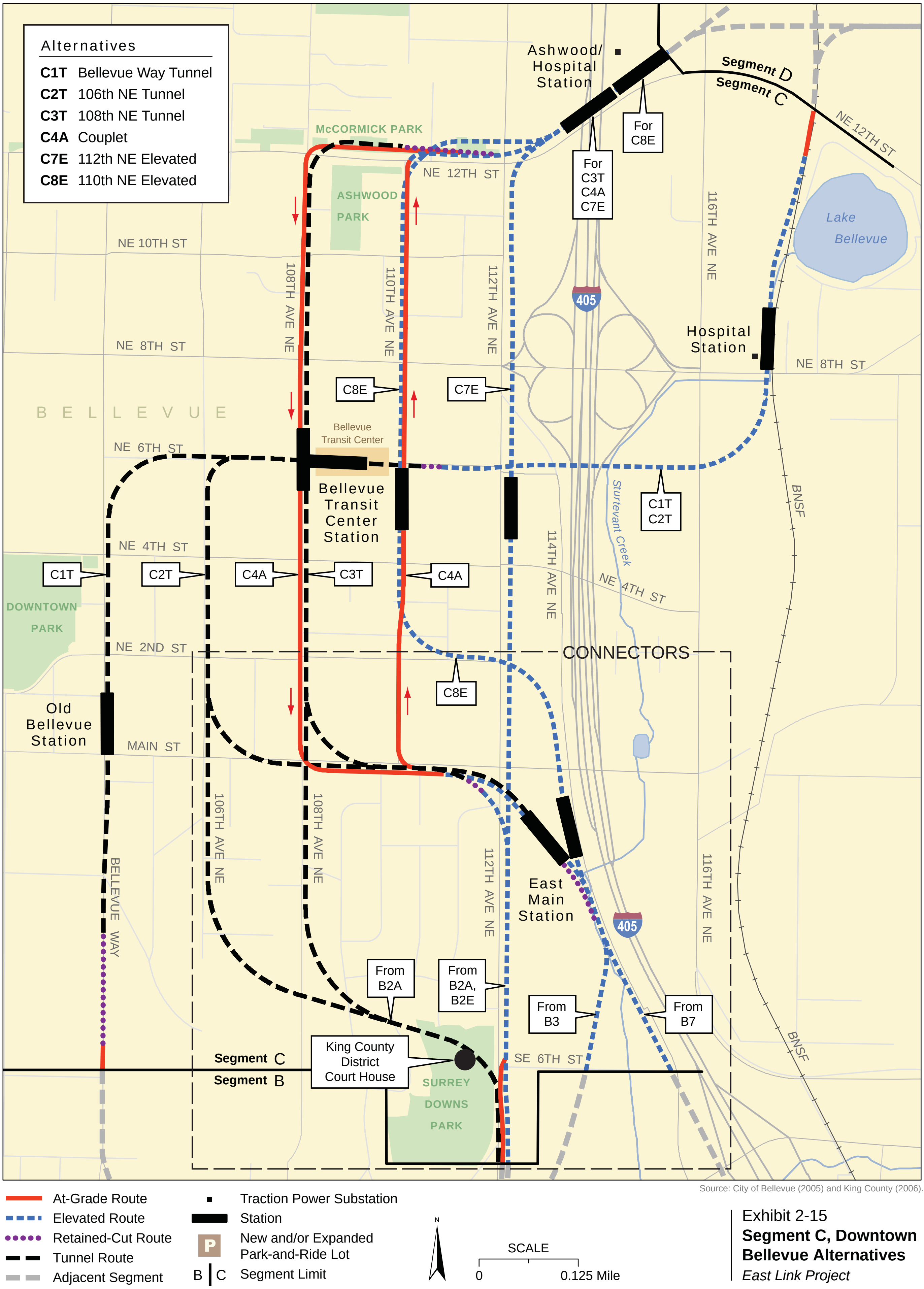
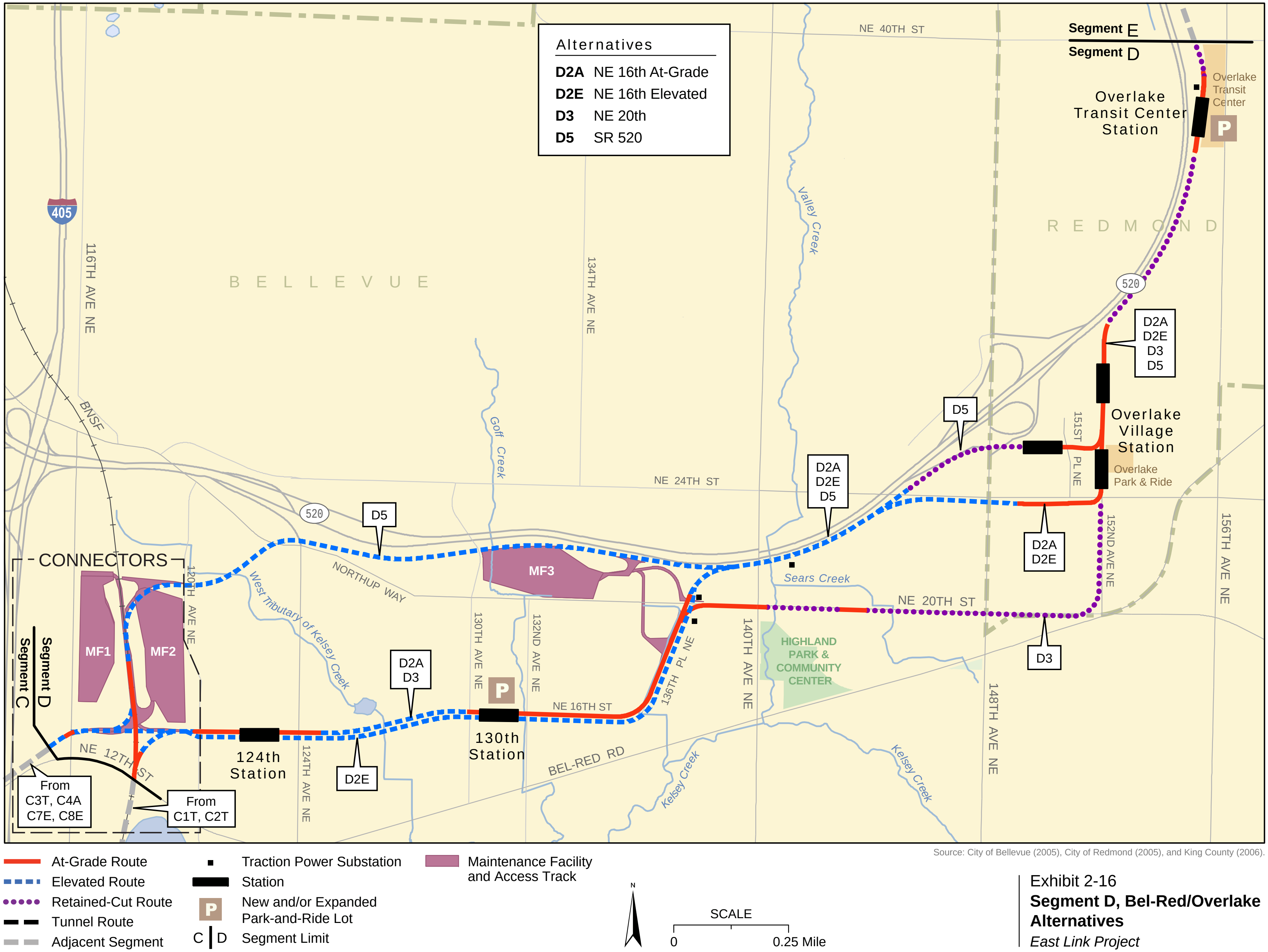
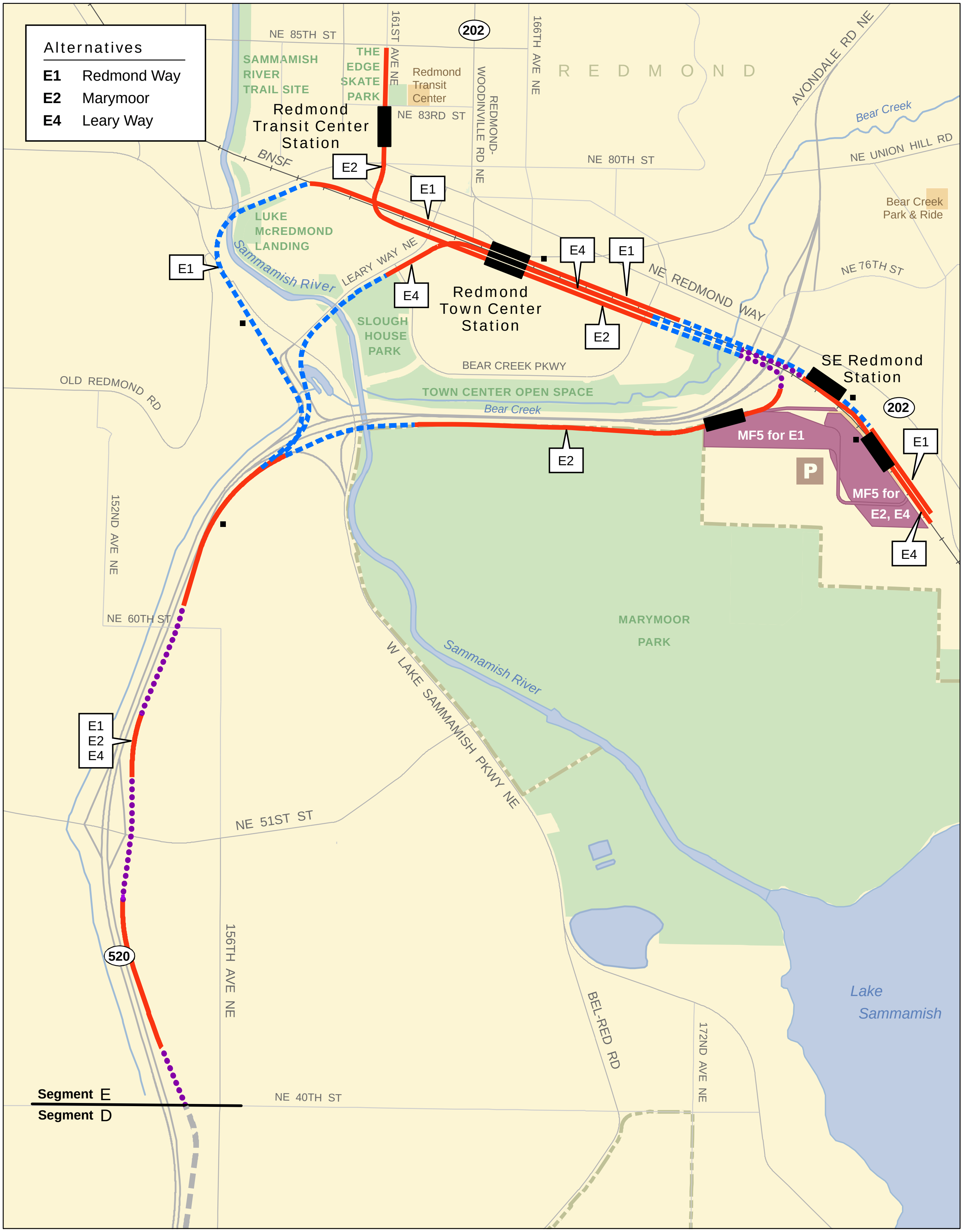


Exhibit 2-15
Segment C, Downtown Bellevue Alternatives
East Link Project



Source: City of Bellevue (2005), City of Redmond (2005), and King County (2006).

Exhibit 2-16
Segment D, Bel-Red/Overlake Alternatives
East Link Project



Source: King County (2006).

- At-Grade Route
- Elevated Route
- Retained-Cut Route
- Tunnel Route
- Adjacent Segment
- Traction Power Substation
- Station
- P New and/or Expanded Park-and-Ride Lot
- D | E Segment Limit
- Maintenance Facility and Access Track

N

SCALE
0 0.25 Mile

Exhibit 2-17
Segment E, Downtown Redmond Alternatives
East Link Project

TABLE 2-2
Characteristics of Light Rail Alternatives

Segment/Alternative	Segment Length (miles)[a]	Segment Travel Time (minutes: seconds)	Number of Stations	Stations
Segment A, Interstate 90				
A1, I–90	6.9	11	2	Rainier, Mercer Island
Segment B, South Bellevue				
B1, Bellevue Way	2.3	5	1	South Bellevue
B2A, 112th SE At-Grade	2.1	5	2	South Bellevue, SE 8th
B2E, 112th SE Elevated	2.1	5	2	South Bellevue, SE 8th
B3, 112th SE Bypass	2.3	5	1	South Bellevue
B7, BNSF	2.6	5	1	118th
Segment C, Downtown Bellevue				
C1T, Bellevue Way Tunnel	1.9	5	3	Old Bellevue, Bellevue Transit Center, Hospital
C2T, 106th NE Tunnel	2.1-2.2	5	2 to 3	Bellevue Transit Center, Hospital, East Main
C3T, 108th NE Tunnel	1.8-2.0	4	2 to 3	Bellevue Transit Center, Ashwood/Hospital, East Main
C4A, At-Grade Couplet	1.6-1.7	7	2 to 3	Bellevue Transit Center, Ashwood/Hospital, East Main
C7E, 112th NE Elevated	1.4-1.5	4	2 to 3	Bellevue Transit Center, Ashwood/Hospital, East Main
C8E, 110th NE Elevated	1.6-1.7	4	2 to 3	Bellevue Transit Center, Ashwood/Hospital, East Main
Segment D, Bel-Red/Overlake				
D2A, NE 16th At-Grade	3.4-3.5	10	3 to 4	124th, 130th, Overlake Village, Overlake Transit Center
D2E, NE 16th Elevated	3.4-3.5	9	3 to 4	124th, 130th, Overlake Village, Overlake Transit Center
D3, NE 20th	3.5-3.6	10	3 to 4	124th, 130th, Overlake Village, Overlake Transit Center
D5, SR 520	3.5	7	2	Overlake Village (two optional locations), Overlake Transit Center
Segment E, Downtown Redmond				
E1, Redmond Way	3.7	6	2	Redmond Town Center, SE Redmond
E2, Marymoor	3.5 to 3.8	6 to 8	2 or 3	Redmond Town Center, SE Redmond, Redmond Transit Center
E4, Leary Way	3.3	6	2	Redmond Town Center, SE Redmond

[a] Ranges are due to variation in length of connections from previous segment or, for E2, the elimination of the Redmond Transit Center Station.

TABLE 2-3
Characteristics of Stations

Segment/Station Name	Associated Alternative	Location	Station Profile	Park-and-Ride Lot: Existing Parking Spaces	Park-and-Ride Lot: Total Parking Spaces (Configuration)
Segment A, Interstate 90					
Rainer	A1	Between Rainier Avenue and 23rd on I–90	at-grade	None	None
Mercer Island	A1	Between 77th and 80th on I–90	at-grade	450	450
Segment B, South Bellevue					
South Bellevue	B1, B2A, B2E, B3	Along Bellevue Way at existing park-and-ride lot	at-grade or elevated	520	1,455 to 1,475 (surface and 4-story structure)
SE 8th	B2A, B2E	SE 8th and 112th	at-grade, retained cut, or elevated	None	None
118th	B7	118th south of SE 8th	elevated	None	1,030 (5-story structure)
Segment C, Downtown Bellevue					
Old Bellevue	C1T	Bellevue Way and Main Street	tunnel	None	None
Bellevue Transit Center	C1T, C2T, C3T, C4A, C7E, C8E	On or near NE 6th at the Bellevue Transit Center	tunnel, at-grade, or elevated	None	None
Hospital[a]	C1T, C2T	NE 8th and BNSF	elevated	None	None
Ashwood/Hospital[a]	C3T, C4A, C7E, C8E	Over I-405 on NE 12th	elevated	None	None
East Main (if from B3 and B7)	C2T, C3T, C4A, C7E, C8E (depends on Design Option)	East of 112th, south of Main Street	elevated or retained cut	None	None
Segment D, Bel-Red/Overlake					
124th[a]	D2A, D2E, D3	Approximately NE 16th at 122nd	at-grade or elevated	None	None
130th[a]	D2A, D2E, D3	Approx NE 16th at 130th	at-grade or elevated	None	300 (surface)
Overlake Village[a]	D2A, D2E, D3, D5	Depending on the alternative, on or near 152nd and near NE 24th	at-grade or retained cut	205	205
Overlake Transit Center[a]	D2A, D2E, D3, D5	NE 40th and 156th	at-grade	170	320 (3-story structure)
Segment E, Downtown Redmond					
Redmond Town Center[a]	E1, E2, E4	BNSF at approximately 166th	at-grade	None	None
SE Redmond	E1, E2, E4	Southeast of the SR 202/Redmond Way SR 520 interchange	at-grade or elevated	None	1,400 (5-story structure)
Redmond Transit Center	E2	161st at NE 83rd	at-grade	380	380

[a] Could serve as an interim station for phasing East Link Project development.

roadway. The additional weight would not change the bridge's ability to remain safe during storm events.

Stray Currents. Stray electrical current from light rail operation could corrode the steel components of the bridge. The project would include three layers of protection: isolating the rail by constructing special insulating systems, installing a stray current collector mat, and a cathodic protection system. Additionally, the project would place a monitoring system on the bridge to monitor stray current levels.

Seismic upgrade. WSDOT has recently adopted a new seismic retrofit policy for bridges, including portions of I-90 where the light rail would be located. Placing light rail on the I-90 structures would not change their seismic vulnerability. However, Sound Transit commits to funding improvements to improve the earthquake resistance of the structures in the corridor used by light rail. Structures assumed to be retrofitted include the columns, bridge seats and restrainers for the light rail portions of the D2 Roadway, Rainier Avenue Overcrossing, approach spans to the floating bridge, and the East Channel Bridge, using the currently known FHWA/AASHTO policies, consistent with WSDOT's own practices for retrofitting existing structures. Retrofits may involve in-water work to improve the earthquake resistance of the floating bridge approach spans and East Channel Bridge. The floating bridge is generally not vulnerable to seismic events due to the dampening effect of the lake water.

Light Rail Installation. The rails are typically attached to a bridge by placing them on concrete plinth blocks. These, the overhead catenary poles, and other pieces of rail equipment are normally attached to a bridge deck with dowel rods. However, the bridge deck has a dense fabric of reinforcing steel and post-tensioning cable. Therefore, it is important to locate this steel during construction to avoid damaging it. Sound Transit has demonstrated that it can locate the steel using the proven method of ground-penetrating radar.

Bridge Maintenance. Some maintenance procedures may change with light rail on the bridge. Sound Transit would work with WSDOT to make sure that the bridge can continue to be maintained satisfactorily.

Segment B: South Bellevue

This segment has five alternatives that connect to Downtown Bellevue in Segment C. The alternatives in this segment have one or two stations at three possible locations: the South Bellevue Station, the SE 8th Station, and the 118th Station. Exhibit 2-14 shows the locations and overall features of the five alternatives, and Exhibits 2-19 to 2-24 show details of each alternative.

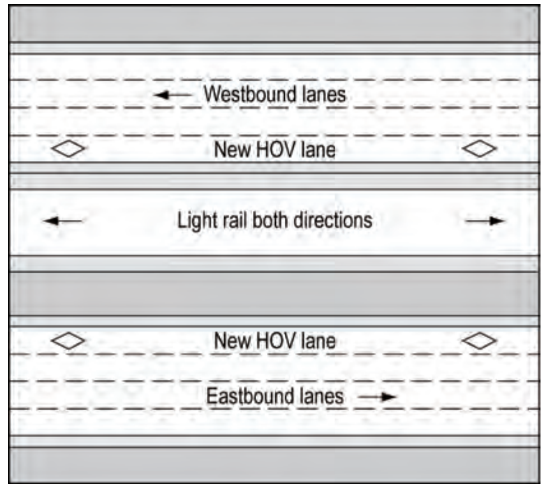


EXHIBIT 2-18
I-90 with Alternative A1

The **Bellevue Way Alternative (B1)** (see Exhibit 2-19) travels within the I–90 center roadway and continues in the Bellevue Way SE HOV direct-access ramp under the westbound lanes of I–90 onto Bellevue Way at-grade to the South Bellevue Station and park-and–ride lot; use of the westbound and eastbound HOV access ramps would be eliminated. Alternative B1 travels in the median of Bellevue Way SE the entire length up to Segment C at SE 6th Street. The South Bellevue Station would include a four-story parking structure; however, only about two stories would appear above the grade of Bellevue Way. To maintain two travel lanes in either direction with light rail in the median, the stretch of Bellevue Way from north of the South Bellevue Station up to SE 6th Street would generally be widened to the west. However, north of the 112th Avenue NE intersection, the widening of Bellevue Way may fluctuate to either side in some locations. There are two traction power substations for B1, one under I–90 where I–90 touches Bellevue and the other near SE 8th Street.

The **112th SE At-Grade Alternative (B2A)** (see Exhibit 2-20) is elevated in the I–90 center roadway, crosses over westbound I–90, and touches down on the east side of Bellevue Way in an elevated profile. With this alternative, the westbound ramp would be maintained and the eastbound I–90 HOV ramp would have the option to either be closed or be kept open by reconstructing the ramp and making other interchange modifications. An elevated station would be located at the South Bellevue Park-and-Ride Lot, with additional parking as provided for the Bellevue Way Alternative (B1). After leaving the station, B2A transitions to at-grade in the median of Bellevue Way, turning into the median of 112th Avenue SE and extending to SE 6th Street. Additional right-of-way would be required

EXHIBIT 2-19
Bellevue Way Alternative (B1)

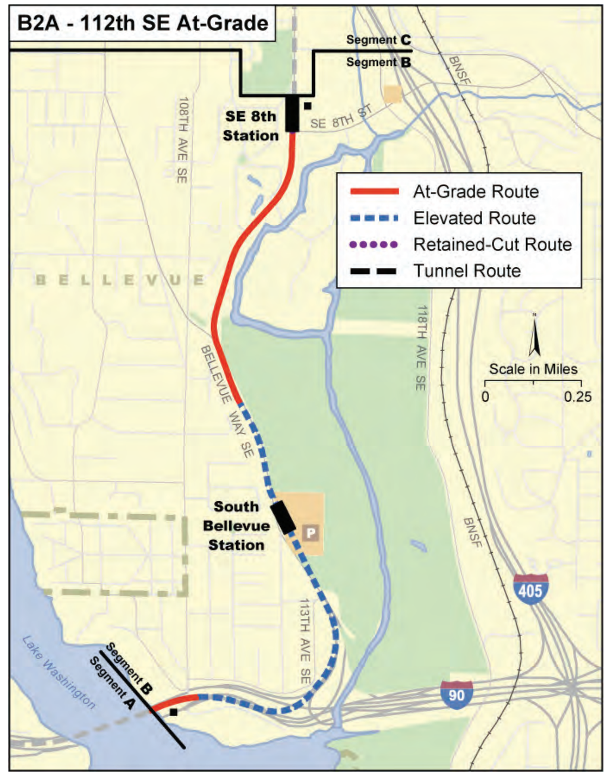


EXHIBIT 2-20
112th SE At-Grade Alternative (B2A)

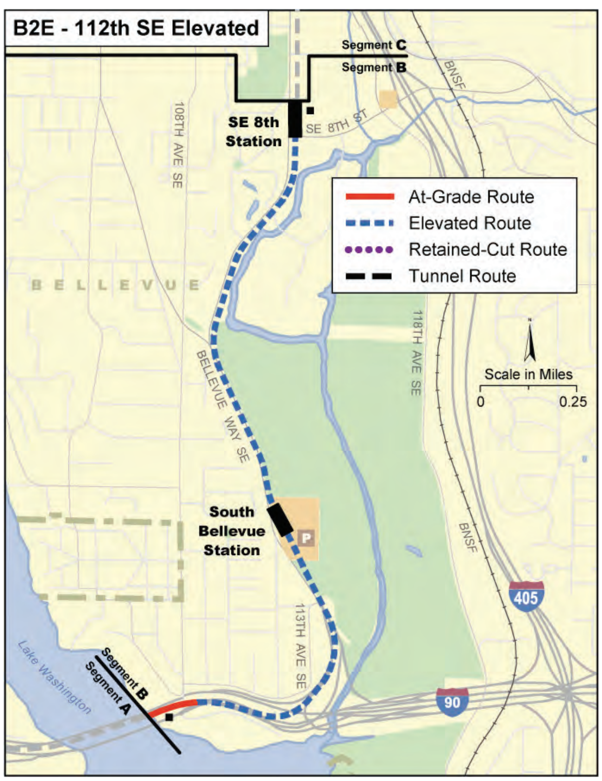


EXHIBIT 2-21
112th SE Elevated Alternative (B2E)

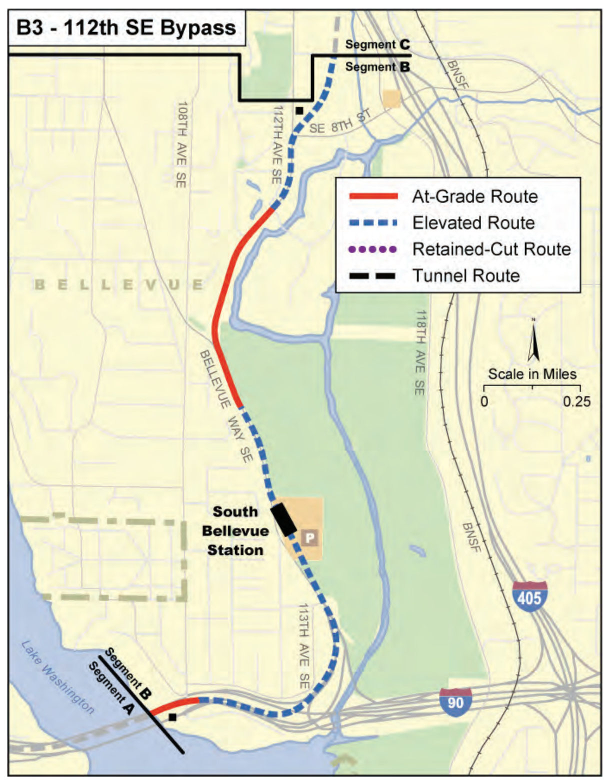


EXHIBIT 2-22
112th SE Bypass Alternative (B3)

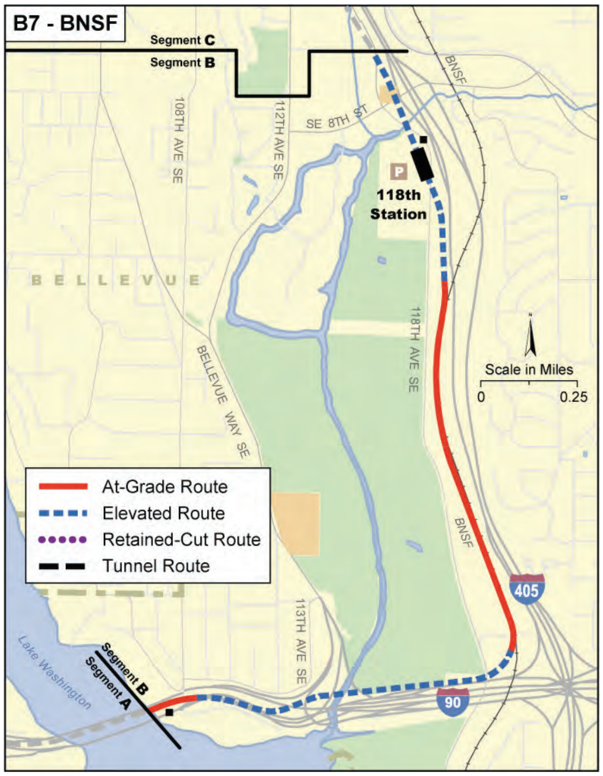


EXHIBIT 2-23
BNSF Alternative (B7)

along the east side of Bellevue Way SE, both north and south of the Frederick Winters House, as well as across from the Frederick Winters House on the west side of the road. Also, 112th Avenue SE would be widened to the east and west within existing right-of-way to maintain existing travel lanes. The profile of the SE 8th Station on 112th Avenue NE depends on which alternative it connects with in Segment C: a retained-cut station if connecting with the tunnel alternatives or an at-grade station if connecting with at-grade and elevated alternatives. There are two traction power substations for B2A, one under I–90 where I–90 touches Bellevue and the other at the SE 8th Station.

The **112th SE Elevated Alternative (B2E)** (see Exhibit 2-21) is the same as the 112th At-Grade Alternative (B2A) up to the South Bellevue Park-and-Ride Station. After the station, B2E crosses to the west side of Bellevue Way SE until just south of the Bellevue Way SE/112th Avenue SE intersection, where the alternative crosses over to continue along the east side of 112th Avenue NE to SE 6th Street. The SE 8th Station is elevated for B2E. Most of the additional right-of-way would be required along the west side of Bellevue Way SE north of the South Bellevue Station and on the east side of 112th Avenue SE just south and north of SE 8th Street. There are two traction power substations for B2E, one under I–90 where I–90 touches Bellevue and the other at the SE 8th Station.

The **112th SE Bypass Alternative (B3)** (see Exhibit 2-22) follows the same route as the 112th SE At-Grade (B2A) and Elevated Alternatives (B2E) to the South Bellevue Park-and-Ride Lot. North of the park-and-ride lot, B3 mimics the B2A alternative in profile and right-of-way requirements, except that it becomes elevated along 112th Avenue SE, south of SE 8th Street, and then turns northeast in new right-of-way behind commercial buildings and up to SE 6th Street. It does not include a SE 8th Station. There are two traction power substations for B3, one under I–90 where I–90 touches Bellevue and the other north of SE 8th Street.

The **BNSF Alternative (B7)** (see Exhibit 2-23) is elevated in the I–90 center roadway similar to B2A, B2E, and B3, except that it crosses over westbound I–90 and the HOV off-ramp near Bellevue Way SE and moves to the north side of I–90 and continues eastbound elevated across Mercer Slough in a new 30-foot right-of-way until it turns north inside the BNSF Railway right-of-way. A typical cross section of the at-grade track in the former BNSF Railway corridor is shown in Exhibit 2-24. Like B2A, B2E, and B3, the eastbound I–90 HOV ramp would be closed or reconstructed and the westbound ramp would be retained with this alternative. The Port of Seattle is in the process of acquiring the BNSF right-of-way from Snohomish to north Renton, including a spur from Woodinville to Redmond. The acquisition process is anticipated to be complete by late 2008. King County is pursuing an agreement with the Port for an easement for a bicycle/pedestrian trail on the BNSF right-of-way. Also, Sound Transit and the Puget Sound Regional Council (PSRC) are studying the feasibility of commuter rail service in the BNSF

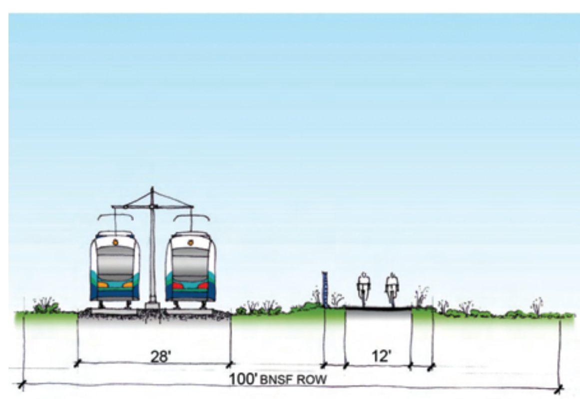


EXHIBIT 2-24
At-Grade Track with Planned Trail in Former BNSF Railway Right-of-Way

corridor. Sound Transit is working with the Port of Seattle and King County to avoid potential conflicts between the intended trail, the East Link Project, and possible future passenger rail operation. The corridor can accommodate both the trail and light rail route in most places, with some areas requiring a small right-of-way acquisition (Exhibit 2-24). Once inside the BNSF right-of-way, B7 transitions to at-grade until the BNSF right-of-way turns east over I-405, at which point B7 becomes elevated, veers west, and crosses 118th Avenue SE to the 118th Street Station south of SE 8th Street. This location is proposed as a new five-story park-and-ride structure that would replace the existing Wilburton Park-and-Ride Lot. B7 continues northward, adjacent to the I-405 right-of-way, up to SE 6th Street. There are two traction power substations for B7, one under I–90 where I–90 touches Bellevue and the other at the 118th Station.

Segment C: Downtown Bellevue

This segment has six alternatives through Downtown Bellevue, crossing I-405 to connect with Segment D at NE 12th Street. The Segment C alternatives connect with most of the five Segment B alternatives, although the Bellevue Way Tunnel Alternative (C1T) connects with only one Segment B alternative (Bellevue Way Alternative [B1]). Each alternative in this segment has three stations at five possible locations: Old Bellevue, Bellevue Transit Center, Hospital, Ashwood/Hospital, and East Main stations. Exhibit 2-15 shows the locations and overall features of the six alternatives, and Exhibits 2-25 to 2-30 show details of each alternative.

In the following descriptions of alternatives, the connectors are described where applicable, then the mainline portion of the alternative is described. The descriptions of the connectors end at the common point where the mainline description continues.

The **Bellevue Way Tunnel Alternative (C1T)** (see Exhibit 2-25) continues at-grade in the median of Bellevue Way SE from B1, then transitions to a tunnel in a retained cut from approximately SE 4th Street to SE 2nd Street. C1T continues in a tunnel to the underground Old Bellevue Station between Main Street and NE 2nd Street. The alternative turns east at NE 6th Street under the Bellevue Arts Museum to an underground station at the Bellevue Transit Center. C1T exits the tunnel after 110th Avenue NE in an elevated profile in the median of 112th Avenue NE and over I-405 and 116th Avenue NE before turning north inside the BNSF Railway right-of-way. The Hospital Station is elevated just north of NE 8th Street. C1T then descends to an at-grade profile to cross under NE 12th Street where it connects to Segment D alternatives. There is only one traction power substation for C1T, located under the elevated guideway near NE 8th Street.

The **106th NE Tunnel Alternative (C2T)** (see Exhibit 2-26) travels from Segment B in a tunnel under 106th Avenue NE, turns east at NE 6th Street, and crosses over I-405 to connect with the Segment D alternatives.

Connectors from Segment B:

- From the 112th NE At-Grade Alternative (B2A), C2T transitions into a retained cut, then a tunnel in the median of 112th Avenue SE before turning northwest under the Surrey Downs Park, on the District Court House side, and diagonally to connect to 106th Avenue NE at Main Street.
- From 112th NE Elevated (B2E) – Elevated on the east side of 112th Avenue, the connector turns west at Main Street and descends into a tunnel west of 112th Avenue NE along the south side of Main Street where it turns to align under 106th Avenue NE.
- From Alternatives B3 and B7, the connectors converge in new right-of-way just south of Main Street to the retained-cut East Main Station. From there, the connector turns west at Main Street and descends into a tunnel under 112th Avenue NE along the south side of Main Street where it turns under a small retail complex to align under 106th Avenue NE.

C2T North of Main Street. C2T continues under 106th Avenue NE in a tunnel and turns east under NE 6th Street to the underground Bellevue Transit Center Station. From this point eastward, the C2T route is identical to C1T as it connects to Segment D alternatives. There is only one traction power substation for C2T, located under the elevated guideway near NE 8th Street.

The **108th NE Tunnel Alternative (C3T)** (see Exhibit 2-27) travels from Segment B in a tunnel under 108th Avenue NE, turns east at NE 12th Street, and crosses I-405 to connect with the Segment D alternatives.

Connectors from Segment B:

- From the 112th NE At-Grade Alternative (B2A), C3T transitions into a retained cut, then tunnels in the median of 112th Avenue SE before turning northwest under the Surrey Downs Park/District Court House site and diagonally to where it connects to 108th Avenue NE at Main Street.

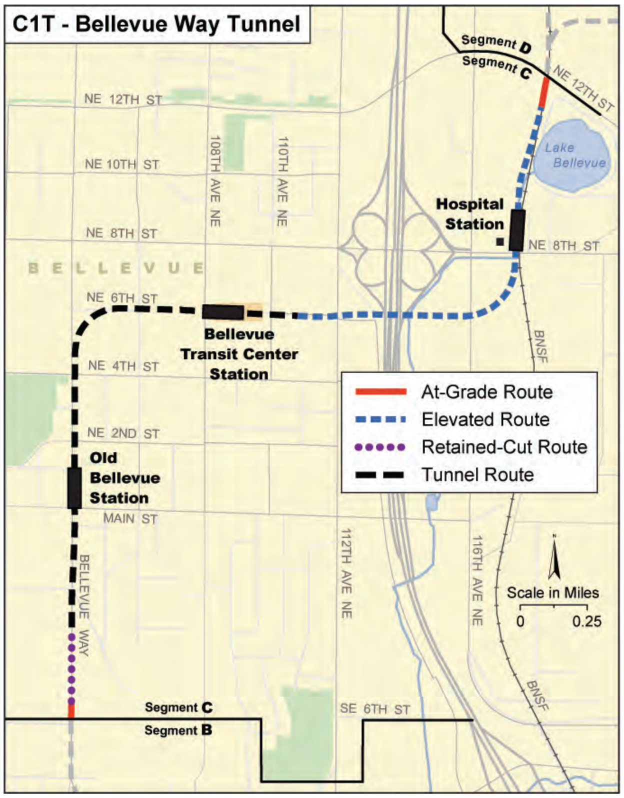


EXHIBIT 2-25
Bellevue Way Tunnel Alternative (C1T)

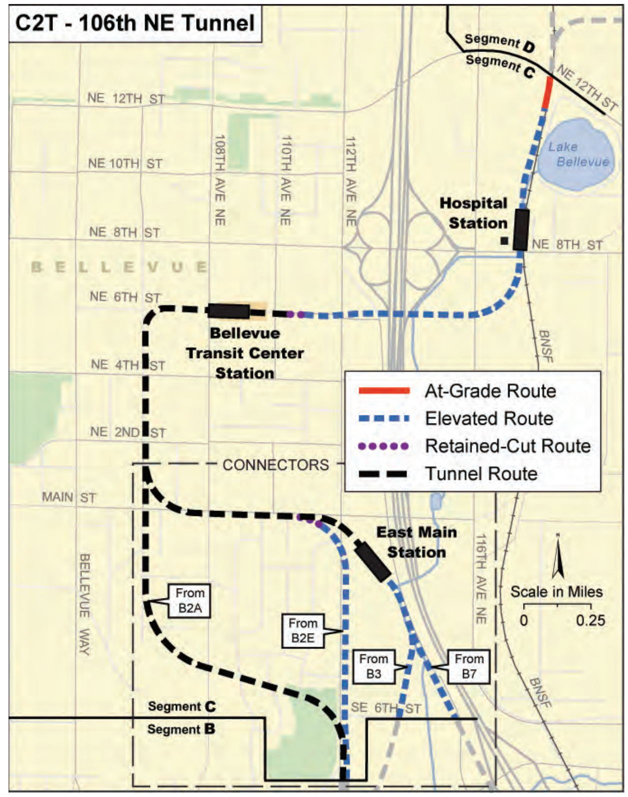


EXHIBIT 2-26
106th NE Tunnel Alternative (C2T)

EXHIBIT 2-27
108th NE Tunnel Alternative (C3T)

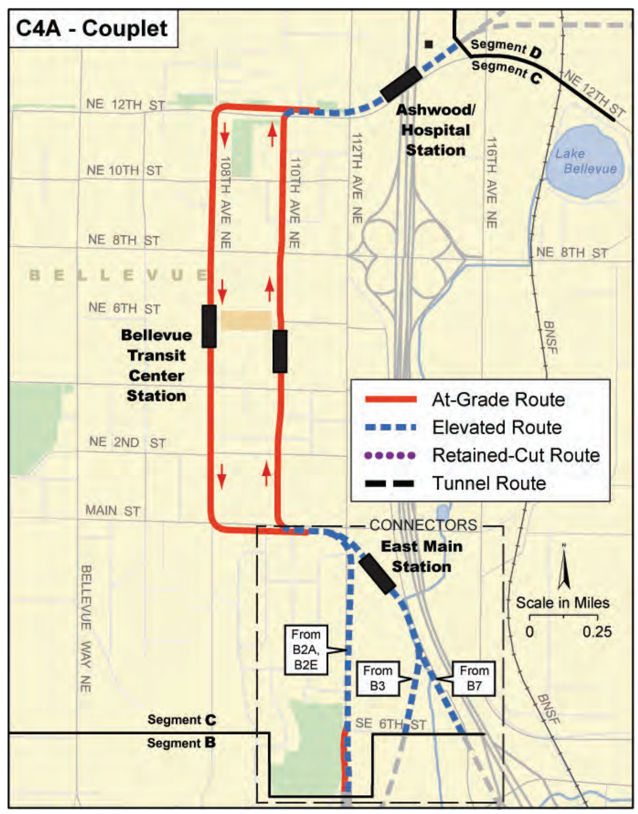


EXHIBIT 2-28
Couplet Alternative (C4A)

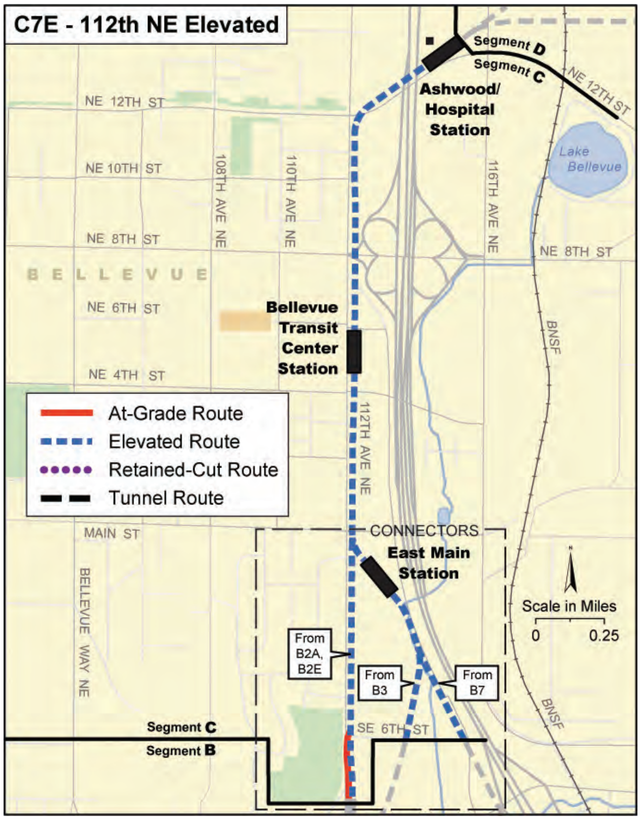


EXHIBIT 2-29
112th NE Elevated Alternative (C7E)

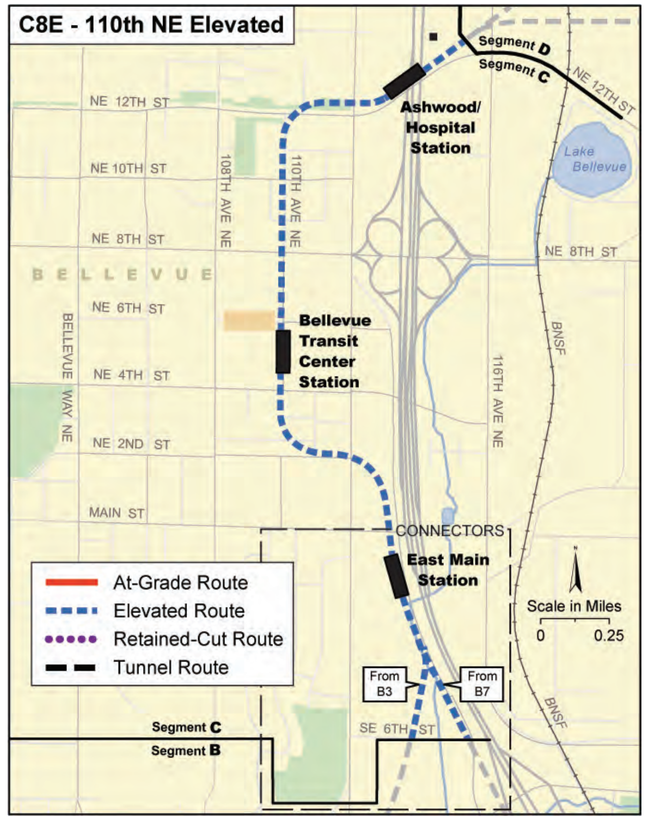


EXHIBIT 2-30
110th NE Elevated Alternative (C8E)

- From 112th NE Elevated (B2E) elevated on the east side of 112th Avenue, the connector turns west at Main Street and descends into a tunnel west of 112th Avenue NE along the south side of Main Street, where it turns in an easement under Tully's to align under 108th Avenue NE.
- From Alternatives B3 and B7, the connectors converge into a new right-of-way west of I-405, then, south of Main Street, and descend into a retained-cut East Main Station. From there, the connector turns west at Main Street and descends into a tunnel under 112th Avenue NE along the south side of Main Street where it turns under Tully's to align under 108th Avenue NE.

C3T North of Main Street. From Main Street, C3T continues along 108th Avenue NE in a tunnel to the underground Bellevue Transit Center Station. The alternative continues north until turning east onto the north side of NE 12th Street. The exit portal is at approximately 110th Avenue NE, and then the guideway transitions to an elevated profile to cross over 112th Avenue NE and I-405 with the Ashwood/Hospital Station located directly over I-405. There is only one traction power substation for C3T, located under the elevated guideway after the I-405 crossing, north of NE 12th Street.

The **Couplet Alternative (C4A)** (see Exhibit 2-28) travels from Segment B at-grade with a northbound track on 110th Avenue NE and southbound track on 108th Avenue NE. It turns east at NE 12th Street and crosses I-405 to connect with the Segment D alternatives.

Connectors from Segment B:

- From 112th NE At-Grade (B2A) from an at-grade to elevated profile on the east side of 112th Avenue, the connector turns west at Main Street and returns at-grade along the south side of the road, with single tracks to 110th and 108th avenues NE.
- From 112th NE Elevated (B2E), elevated on the east side of 112th Avenue, the connector is the same as B2A.
- From Alternatives B3 and B7, the connectors converge just south of Main Street to the elevated East Main Station. From there, the connector turns west at Main Street, crosses over 112th Avenue SE, and descends to an at-grade profile along the south side of Main Street, with tracks to 110th and 108th avenues NE.

C4A North of Main Street. Between Main Street and NE 12th Street, C4A is an at-grade couplet using 110th and

108th avenues NE. This alternative would require changing Bellevue's proposed couplet (106th and 108th avenues NE) to 108th and 110th Avenues NE. The northbound track on 110th Avenue NE would remove one lane of traffic and 110th would become one way in the southbound direction (Exhibit 2-31). The southbound track on 108th Avenue NE would remove one lane of traffic and assumes that 108th would become one way in the northbound direction. In C4A the light rail would run counterflow to automobile traffic on 108th and 110th Avenues NE, which would improve visibility with automobiles and provides protected movement through the intersection. Operating light rail vehicles in the opposite direction as automobile traffic would also allow two-way bus service in a joint-use lane between NE 4th Street and NE 8th Street in Downtown Bellevue. The Bellevue Transit Center Station would be on 108th and 110th avenues NE south of NE 6th Street. The couplet would combine into a double track going east north of NE 12th Street in an elevated profile to cross over 112th Avenue NE and I-405, with the Ashwood/Hospital Station located directly over I-405. There would be only one traction power substation for C4A, located under the elevated guideway after the I-405 crossing, north of NE 12th Street.

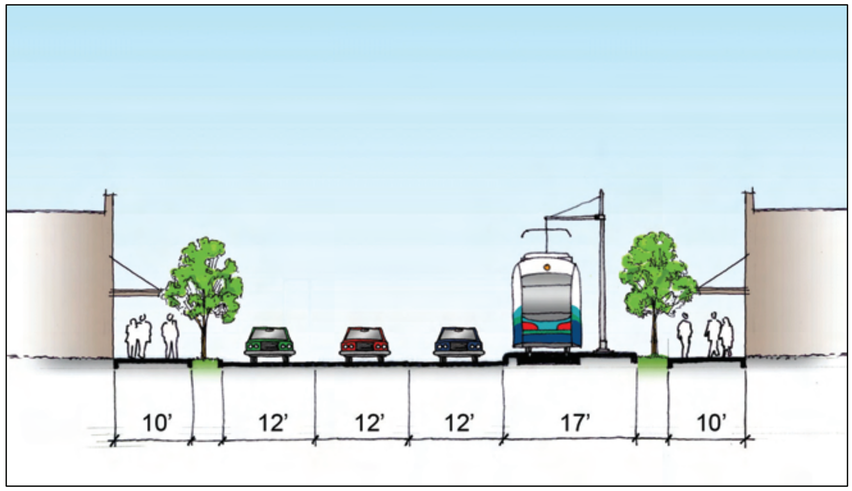


EXHIBIT 2-31
At-Grade, Side Running on 110th and 108th Avenue NE

The **112th NE Elevated Alternative (C7E)** (see Exhibit 2-29) travels from Segment B elevated along 112th Avenue NE, turns east at NE 12th Street, and crosses I-405 to connect with the Segment D alternatives.

Connectors from Segment B:

- From 112th NE At-Grade (B2A) – From an at-grade to elevated profile on the east side of 112th Avenue, the connector crosses Main Street.
- From 112th NE Elevated (B2E) – Elevated on the east side of 112th Avenue, the connector is the same as B2A.
- From alternatives B3 and B7, the connectors converge just south of Main Street to an elevated East Main Station. From there, the connector turns northwest along the east side of 112th Avenue NE and crosses Main Street.

C7E North of Main Street. From Main Street, C7E is an elevated profile along the east side of 112th Avenue NE, with the Bellevue Transit Center Station south of NE 6th Street and a pedestrian overpass connecting to the Bellevue Transit Center. C7E continues elevated turning east at NE 12th Street to cross over 112th Avenue NE and I-405, with the Ashwood/Hospital Station located just east of I-405. There is only one traction power substation for C7E, located at the Ashwood/Hospital Station east of I-405 and north of NE 12th Street.

The **110th NE Elevated Alternative (C8E)** (see Exhibit 2-30) travels from Segment B adjacent to 114th Avenue NE/I-405, turns west at NE 2nd Street and north elevated along 110th Avenue NE, turns east at NE 12th Street, and crosses I-405 to connect with the Segment D alternatives.

Connectors from Segment B. From alternatives B3 and B7, the connectors converge just south of Main Street to the elevated East Main Station. From there, the connector continues north over Main Street adjacent to I-405/114th Avenue NE.

C8E North of Main Street. From Main Street, C8E is an elevated profile adjacent to 114th Avenue NE/I-405, turning west at NE 2nd Street, crossing over 112th Avenue NE, and turning north at 110th Avenue NE to the median of the road and to an elevated Bellevue Transit Center station south of NE 6th Street. C8E continues elevated in the median of 110th Avenue NE, turning east at NE 12th Street to cross over 112th Avenue NE and I-405, with the Ashwood/Hospital Station located over I-405. There is only one traction power substation for C8E, located under the elevated guideway after the I-405 crossing, north of NE 12th Street.

Interim Termini in Segment C. The East Link Project may be constructed in phases depending on available funding or other factors. In Segment C, an interim terminus location may be located at the Hospital Station or Ashwood/Hospital Station, depending on the alternative selected. However, operational plans may require the construction of a maintenance facility. The closest of the alternative maintenance facility sites is in Segment D, so an access track and maintenance facility may be built beyond Segment C under this phasing scenario. In addition, an interim terminus would require tail tracks up to 850 feet beyond the station platform for temporary layover of a 4-car train.

Segment D: Downtown Bellevue to Overlake Transit Center

There are four alternatives in Segment D, which combines both the City of Bellevue's Bel-Red Corridor and Redmond's Overlake Village planning areas. All Segment D alternatives begin with connections from either the north side of NE 12th Street across 116th Avenue NE or from the BNSF Railway right-of-way coming from NE 6th Street. These are referred to below as connections from NE 12th or BNSF. Segment D alternatives have between two and four stations at four possible locations: the 124th, 130th, Overlake Village, and Overlake Transit Center stations. Alternatives D2A, D2E, and D3 have the options that both the 124th and 130th stations could be built, or that only one of the two stations would be built. Exhibit 2-16 shows the locations and overall features of the four alternatives, and Exhibits 2-32 to 2-35 show details of each alternative.

The **NE 16th At-Grade Alternative (D2A)** (see Exhibit 2-32) forges a new east-west corridor from 116th Avenue NE at approximately NE 16th Street in a mixed at-grade and elevated profile. The light rail track is proposed to be in the median of the planned roadway. Alternative D2A is at-grade at the 124th Avenue NE station, then elevated beyond 124th Avenue NE to 130th Avenue NE. It returns at-grade at the NE 130th Station, which includes a surface park-and-ride lot. It continues east in the median of NE 16th Street and then north in the median of 136th Avenue NE; widening on both sides of the existing roads would occur. The alternative continues north, crossing NE 20th Street where it transitions to an elevated structure adjacent to the south side of SR 520. It turns east away from SR 520 along the south side of NE 24th Street. Just beyond 148th Avenue NE, D2A is at-grade and turns north on the west side of 152nd Avenue NE into Overlake Village near an existing park-and-ride lot; the number of existing travel lanes on both NE 24th Street and 152nd Avenue would remain. No additional parking is proposed at the Overlake Village Station. D2A continues north and turns east at SR 520 into a retained cut on the south side of the SR 520 right-of-way up to the Overlake Transit Center Station. The existing park-and-ride lot would be reconfigured to accommodate the new station, and a new three-story parking structure would be built. Existing facilities such as the bus transfer loops and Microsoft shuttle service and operations facility would continue to exist, however, in different locations on the park-and-ride site. Immediately after leaving the station, the route descends into a retained-cut profile under NE 40th Street and connects with all the Segment E alternatives.

There are two traction power substations for D2A: one located under the elevated guideway north of NE 20th Street and another at the Overlake Transit Center Station.

The **NE 16th Elevated Alternative (D2E)** (see Exhibit 2-33) is an elevated version of NE 16th At-Grade Alternative (D2A) until 132nd Avenue NE, where the alternative crosses to the south side of NE 16th Street, requiring street widening, then transitions to the west side of 136th Place NE, also requiring about 10 feet of widening. Just north of NE 20th Street, D2E mimics the profile of D2A. There are two traction power substations for D2E: one located under the elevated guideway north of NE 20th Street and another at the Overlake Transit Center Station.

The **NE 20th Alternative (D3)** (see Exhibit 2-34) follows the same route as the NE 16th At-Grade Alternative (D2A) until the alternative approaches NE 20th Street, where it turns east into the median of NE 20th Street at-grade, requiring widening on either side of the road, then into a retained cut east of 140th Avenue NE. D3 remains in a retained-cut profile, heading north at 152nd Avenue NE, transitions to an at-grade center-running route just south of NE 24th Street; 152nd Avenue NE would be widened to the east and west. The alternative continues north to Overlake Village and then mirrors the D2A profile and station descriptions, except that D3 is in the median of 152nd Avenue NE. There are two traction power substations for D3: one located adjacent to the route at the intersection of 136th and NE 20th Street and another at the Overlake Transit Center Station.

The **SR 520 Alternative (D5)** (see Exhibit 2-35) is elevated from the north side of NE 12th Street, or at-grade in the BNSF Railway, turns east at approximately NE 20th Street, crosses Northup Way, and continues east on the south side of SR 520. The alternative crosses over NE 24th Street and then transitions into a retained-cut profile under 148th Avenue NE and then into the retained cut/at-grade

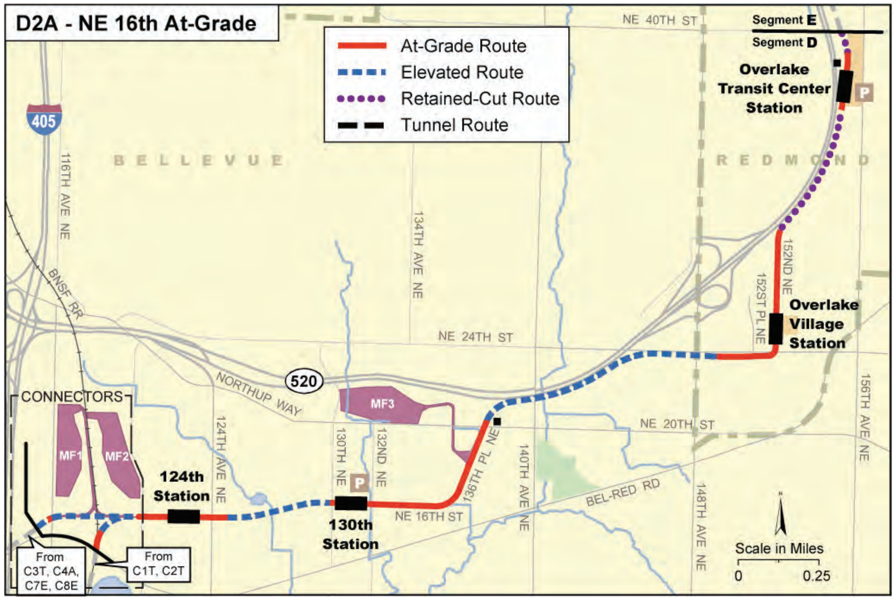


EXHIBIT 2-32
NE 16th At-Grade Alternative (D2A)

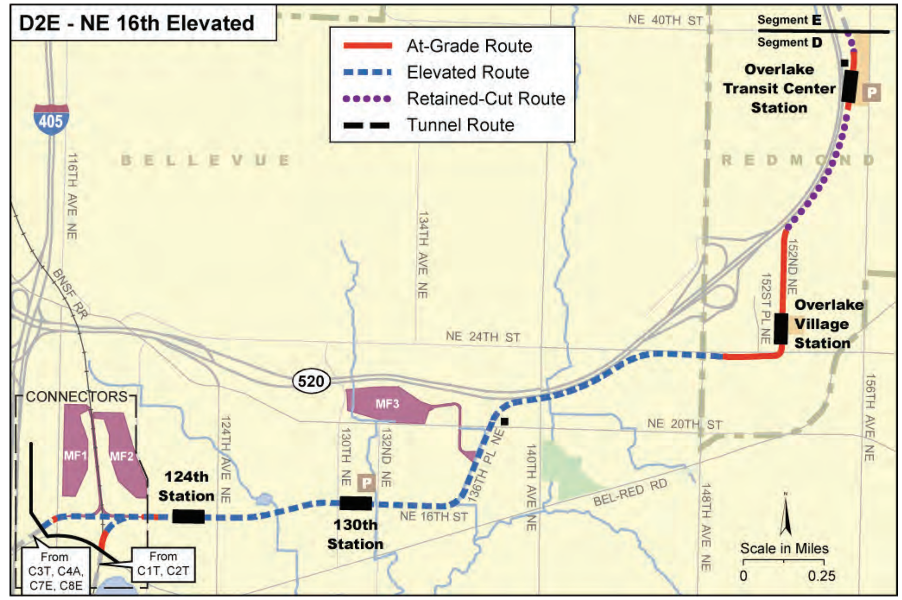


EXHIBIT 2-33
NE 16th Elevated Alternative (D2E)

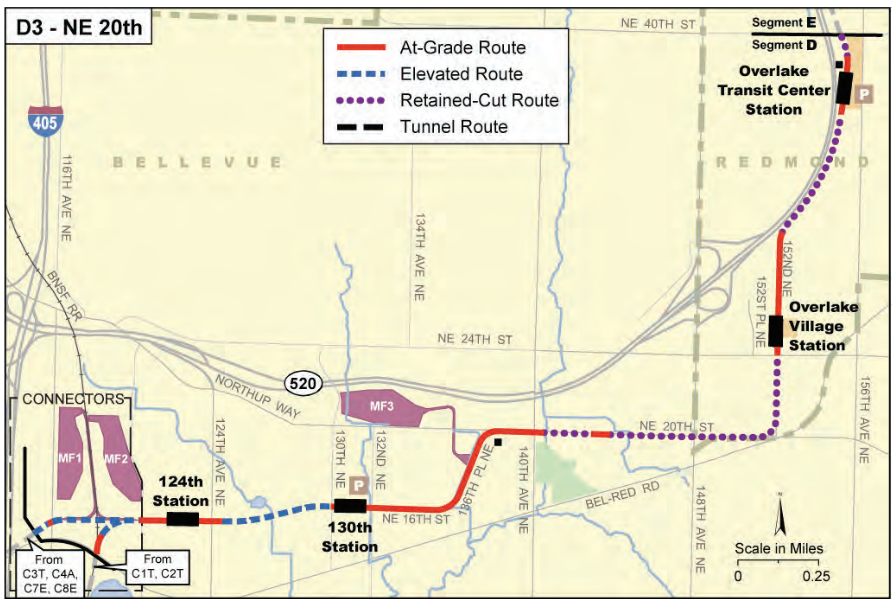


EXHIBIT 2-34
NE 20th Alternative (D3)

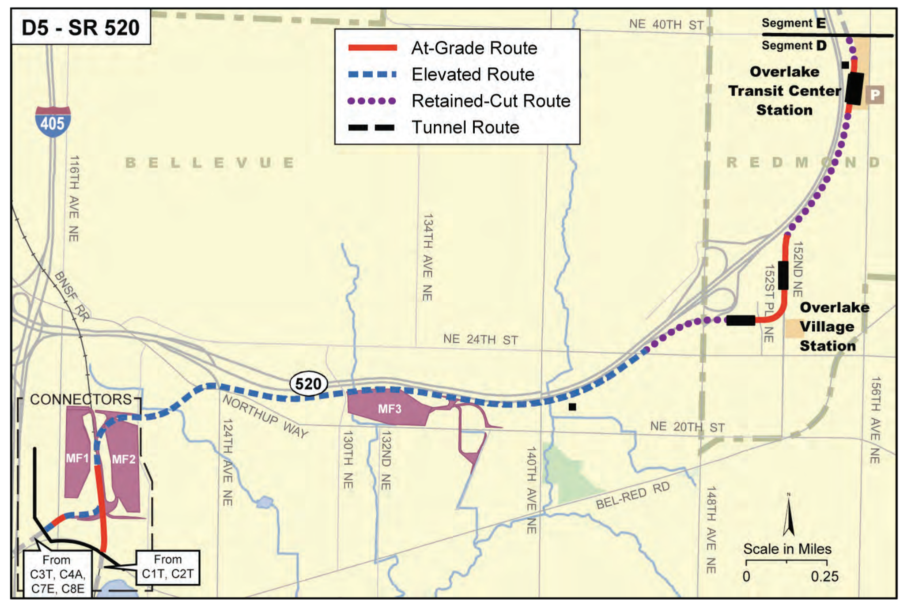


EXHIBIT 2-35
SR 520 Alternative (D5)

station at the Overlake Village Station behind the Safeway store or at the Overlake Village Station at NE 25th Street along the west side of 152nd Avenue NE. From 152nd Avenue NE, D5 is similar to the NE 16th At-Grade Alternative (D2A) going to Segment E. There are two traction power substations for D5: one located under the elevated guideway east of 140th Avenue NE, and another at the Overlake Transit Center Station.

Interim Termini in Segment D. Depending on available funding, build out of the selected alternative in Segment D may have an interim terminus at any of the proposed stations. This would include access tracks to connect with a maintenance facility within Segment D, if one is constructed. In addition, an interim terminus would require tail tracks up to 850 feet beyond the station platform for temporary layover of a four-car train.

Segment E: Overlake Transit Center to Downtown Redmond

All Segment E alternatives follow one route from Segment D along the south side of SR 520 until they split into three different routes accessing Downtown Redmond. From the Overlake Transit Center, all Segment E alternatives follow along the south side of SR 520 and under NE 40th Street, NE 51st Street, and NE 60th Street in a retained-cut profile. The three alternatives split into three different routes at the SR 520 interchange with Lake Sammamish Parkway. The Marymoor Alternative (E2) crosses the interchange to continue east along the south side of SR 520.

Alternatives in this segment have two or three stations at three possible locations: the Redmond Town Center, SE Redmond, and Redmond Transit Center stations. Exhibit 2-17 shows the locations and overall features of the three alternatives, and Exhibits 2-36 to 2-38 show details of each alternative.

The **Redmond Way Alternative (E1)** becomes elevated and crosses north over SR 520 (see Exhibit 2-36), follows the northwest side of West Lake Sammamish Parkway, and turns northeast on the south side of Redmond Way in a new bridge structure over the Sammamish River. E1 continues along Redmond Way and turns southeast into an at-grade profile into the BNSF Railway right–of-way to Redmond Town Center Station at NE 76th Street, then transitions to an elevated structure over Bear Creek and the SR 520/ SR 202 interchange to the terminus, SE Redmond Station. This station would include a four-story structured park-and-ride facility in the industrial park adjacent to the BNSF Railway corridor. An 800-foot-long tail track would extend past the station for train layovers. There are two traction power substations for E1: one located under the elevated guideway adjacent to West Lake Sammamish Parkway and another at the SE Redmond Station.

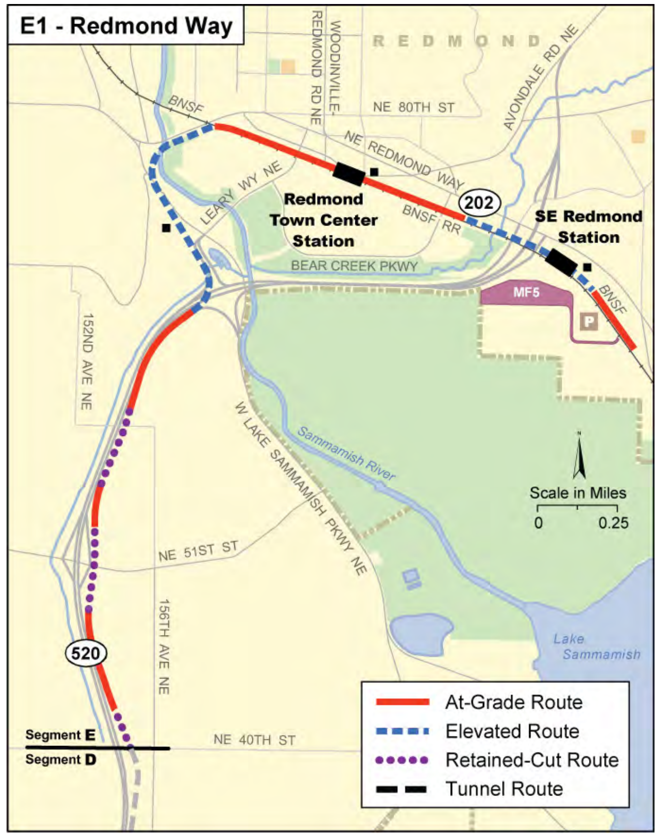


EXHIBIT 2-36
Redmond Way Alternative (E1)

The **Marymoor Alternative (E2)** (see Exhibit 2-37) remains elevated on the south side of SR 520 in a new bridge structure over the Sammamish River, descending down to grade and straddling the SR 520 right-of-way and Marymoor Park property lines. The SE Redmond station and parking structure is located on the south side of the SR 520/SR 202 interchange, including a park-and-ride lot. After the station, E2 turns west going under the SR 520/SR 202 interchange and enters the BNSF Railway right–of-way elevated over Bear Creek. E2 becomes at-grade for the Redmond Town Center Station and then continues north at NE 161st Street in the center roadway, with a terminus station at the Redmond Transit Center. An 800-foot-long tail track would extend past the station for train layovers. Sound Transit is also considering an option to terminate E2 at the Redmond Town Center Station and extend the tail tracks within the BNSF corridor. There are two traction power substations for E2: one located adjacent to the route before approaching West Lake Sammamish Parkway and another at the Redmond Town Center Station.

The **Leary Way Alternative (E4)** (see Exhibit 2-38) crosses north over SR 520 and is elevated on the northwest side of West Lake Sammamish Parkway, and it turns northeast along the south side of Leary Way, crossing the Sammamish River on a new bridge structure, then transitions to an at-grade profile south of Bear Creek Parkway and turns southeast in the BNSF Railway right-of-way. The alternative continues along the BNSF Railway, crosses over Bear Creek on a bridge, and then transitions into a retained-cut profile under SR 520 before terminating in an at-grade profile.

The SE Redmond terminus station would include a four-story structured park-and-ride facility in the industrial park adjacent to the BNSF Railway corridor. A 1,600-foot-long tail track would extend past the station for train layovers. There are two traction power substations for E4: one located adjacent to the route before approaching West Lake Sammamish Parkway and another at the SE Redmond Station.

Interim Termini in Segment E. In Segment E, it is possible that either the SE Redmond Station for E2 or the Redmond Town Center Station for E1 or E4 could become an interim terminus. Remaining stations in Segment E are considered to be the final terminus station for East Link.

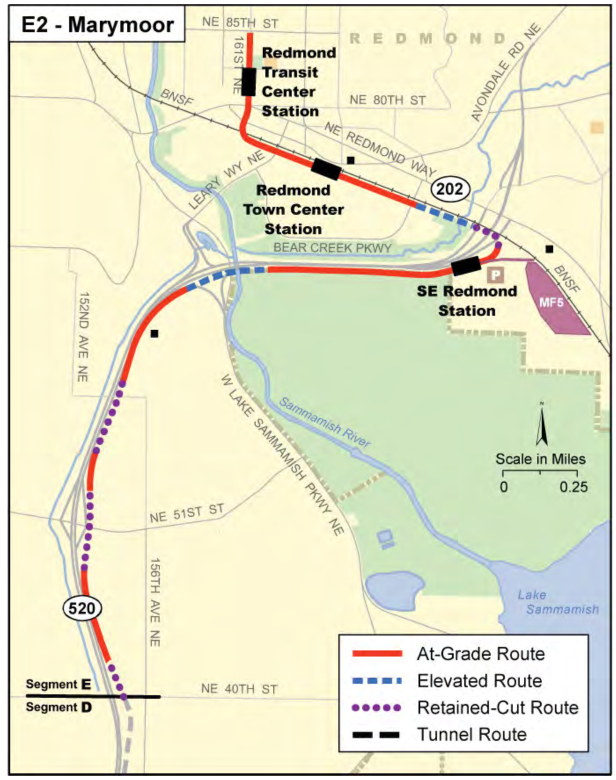


EXHIBIT 2-37
Marymoor Alternative (E2)

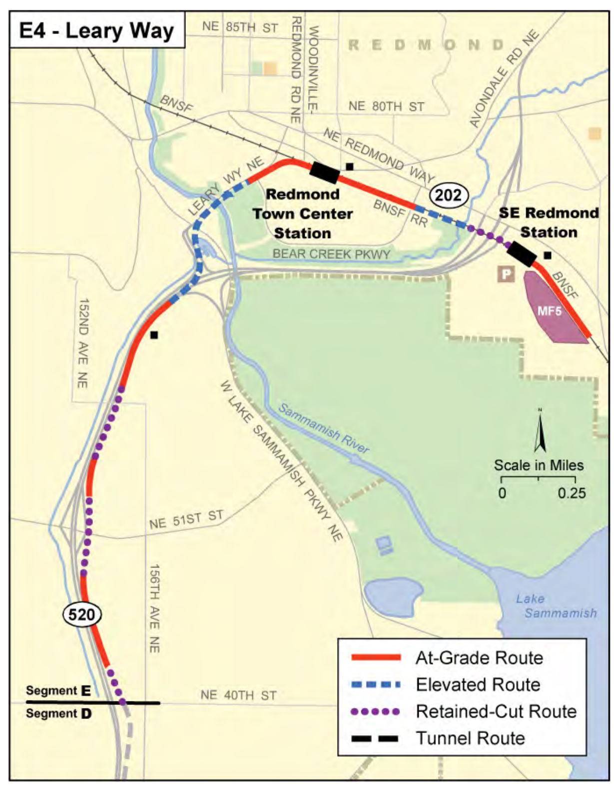


EXHIBIT 2-38
Leary Way Alternative (E4)

2.3.3 Maintenance Facility Alternatives

A maintenance facility would be needed with full build out of the East Link Project to provide for light maintenance activities without traveling to Sound Transit's Central Link Operations and Maintenance facility located in South Seattle and also to provide for vehicle storage beyond the Seattle facility capacity. A site of approximately 10 to 15 acres would be needed for maintenance and storage of up to about 40 light rail cars. A maintenance facility is not funded in the ST2 Plan and may not be needed until the project extends past the Overlake Transit Center Station. Major inspections, heavy repairs, and overhauls would remain at the Central Link facility. The East Link maintenance facility would primarily serve the following functions:

- Storage for approximately 40 vehicles
- Car washing facility for exterior vehicle cleaning
- Interior cleaning of light rail vehicles
- Daily service and inspection of revenue vehicles
- Corrective and preventive maintenance
- Maintenance of track facilities
- East Link operating offices

- Light rail vehicle operator reporting and ready-room areas

Exhibit 2-39 illustrates a prototypical layout for an East Link maintenance facility. Table 2-4 describes the characteristics of the proposed maintenance facilities. There are four alternative maintenance facility sites, three in Segment D and one in Segment E. All the alternatives in Segment D were designed with access to any of the three alternative maintenance facilities; likewise, all Segment E alternatives could connect to the maintenance facility MF5. Exhibits 2-16 and 2-17 show the potential maintenance facility locations in Segments D and E. Details of the alternative maintenance facility sites are shown in Exhibits 2-32 to 2-34 for the Segment D sites and in Exhibits 2-36 to 2-38 for the Segment E sites.

116th Avenue NE Maintenance Facility (MF1). MF1 is between 116th Avenue NE and the BNSF Railway right-of-way. Constructing this facility would require substantial cut and fill to create a flat area for operations.

124th Avenue NE Maintenance Facility (MF2). MF2 is between 120th Avenue NE and the BNSF right-of-way and would require a minor amount of cut and fill to create a flat area.

SR 520 Maintenance Facility (MF3). MF3 is located adjacent to the south side of the SR 520 right-of-way between roughly 130th Avenue NE and 135th Avenue NE. This site would require a moderate amount of cut and fill to create a flat area.

TABLE 2-4
Maintenance Facility Characteristics

	Maintenance Facility Size (acres)	Access Track (feet)
MF1, NE 116th Maintenance Facility		
From Both NE 16th At-Grade (D2A) and Elevated (D2E) Alternatives and NE 20th (D3) Alternative	11.6	1,800
From SR 520 (D5)	11.7	1,050
MF2, BNSF Maintenance Facility		
From Both NE 16th At-Grade (D2A) and Elevated (D2E) Alternatives and NE 20th (D3) Alternative	12.3	1,600
From SR 520 (D5)	14.7	1,500
MF3, SR 520 Maintenance Facility		
From Both NE 16th At-Grade (D2A) and Elevated (D2E) Alternatives	14.2	1,100
From NE 20th (D3)	14.2	460
From SR 520 (D5)	14.2	1,300
MF5, SE Redmond Maintenance Facility		
From Redmond Way (E1)	11.5	1,300
From Marymoor (E2)	14.9	1,000
From Leary Way (E4)	14.9	800

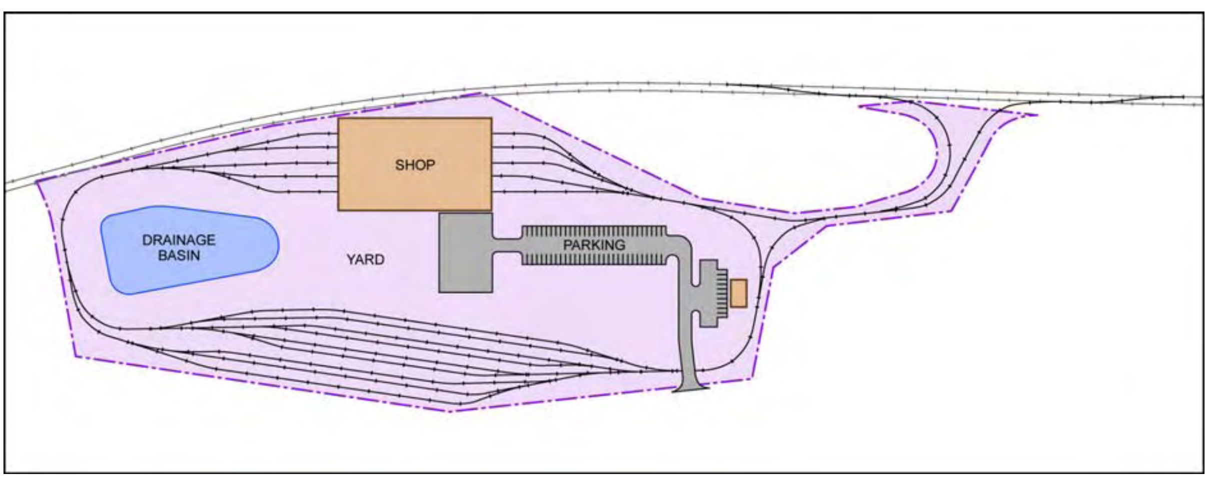


EXHIBIT 2-39
Prototypical Layout of East Link Maintenance Facility

SE Redmond Maintenance Facility (MF5). MF5 has two possible locations, depending on which Segment E alternative is selected. For the Redmond Way Alternative (E1), the maintenance facility would be located southwest of the SR 520/SR 202 interchange and would be accessed via an access track from the BNSF Railway corridor. For the Marymoor (E2) and Leary Way (E4) alternatives, the maintenance facility would be located directly adjacent to the BNSF corridor south of the SR 520/SR 202 interchange. For E2, which does not enter the BNSF corridor in this area, an access track from the new park-and-ride facility south of SR 520 would access the maintenance facility. These sites would require minimal to no grading to create a flat area for operations.

2.3.4 Capital Equipment and Operations

2.3.4.1 Overhead Contact System

Light rail vehicles are electrically powered by an overhead contact system (commonly called an “overhead catenary system,” or OCS) (Exhibit 2-40). Support poles are typically located between the two tracks for at-grade and elevated profiles, except in special circumstances such as at stations, at crossover tracks, and on the I–90 bridge. They are between 15 and 23 feet high and a vegetation clear zone is maintained within about 15 feet from the centerline of the tracks. Only on I–90, the OCS would be supported either by two poles on both sides of the guideway or by poles on one side. In tunnels, the OCS is attached to the tunnel ceiling. Catenary poles are located approximately 200 feet apart. Two wires are visible between each pole for each track (the messenger wire and the contact wire), or four wires for two tracks.

EXHIBIT 2-40
Overhead Catenary System

2.3.4.2 Traction Power Substations

Electric power for the trains would be provided from the existing electrical grid, through traction power substations. The traction power substations (TPSS) are completely enclosed small metal buildings, about 20 feet by 60 feet in size, with an additional 10 to 20 feet required around each unit (Exhibit 2-41). They can be screened from view with a wall or fence. These electric substations would be installed at about 2-mile intervals. The purpose of the traction power substation is to boost the power to the OCS. Automobile access is also required for each traction power substation.

EXHIBIT 2-41
Traction Power Substation

The locations of the traction power substations are based on power distribution needs. While the approximate locations of TPSS are shown in the alternative maps in Exhibits 2-13 through 2-17, there is some flexibility in the ultimate location of these facilities. When possible, they would be placed in the footprint of a light rail station or trackway or adjacent to the track where remaining right-of-way is available.

2.3.4.3 Tunnel Vents

Ventilation structures are necessary to provide emergency ventilation and climate control for the below-grade stations and tunnel segments. Alternatives that are in a tunnel or are lidded have a set of vent shafts. These are typically located at stations. The surface building enclosing the shaft would include an exhaust and intake in the roof, a fan room, and space for electrical and communications equipment. These may be integrated with the structures for vertical station access. Ventilation would also be provided at the tunnel portals by jet fans, including in existing I-90 tunnels used by light rail.

2.3.4.4 Tail and Crossover Tracks

Tail tracks are tracks that extend past a terminus station far enough for temporary layover of one four-car train, typically up to 850 feet beyond the last station platform. Tail tracks also enable trains to enter terminal stations at higher speeds because they provide longer safe braking distances. These tracks would be necessary at interim terminus locations as well as the ultimate terminus station. Crossover tracks connect the two parallel tracks and allow trains to safely pass from one set of track to the other (Exhibit 2-42). Crossovers would be provided along the line to allow for scheduled maintenance that requires removing one track from service during track maintenance, to bypass a stalled train, to turn to the opposite direction, or to operate in the event of emergencies and blockages.

2.3.4.5 Vehicles and Operations

Operation of the East Link system would be integrated with the Central Link system and any future extensions north and south of Central Link. East Link is planned to operate 20 hours per day, 7 days per week. Service levels would vary during the day according to the peaking characteristics of the ridership. Table 2-5 shows the expected service schedule for weekdays based on 2030 ridership forecasts. Weekend and holiday service are based on early/late levels of service. The ridership forecasts indicate that a four-car train would be needed during peak periods by 2030. Other times may only require a two- or three-car train.

EXHIBIT 2-42
Crossover Tracks

Conventional low-floor light rail vehicles would be used to provide level boarding for all passengers and would be easily accessible by people with disabilities. Trains would operate with up to four cars during peak periods and fewer cars during off-peak times (see Appendix E, Operating Plan Summary).

TABLE 2-5
Weekday Service Periods

Service Period	Time Period	Service Level	Train Frequency (minutes)
Early morning	5:00 a.m. to 6:00 a.m.	early/late	15
Morning peak	6:00 a.m. to 8:30 a.m.	peak	9
Midday	8:30 a.m. to 3:00 p.m.	base	10
Afternoon peak	3:00 p.m. to 6:30 p.m.	peak	9
Evening	6:30 p.m. to 10:00 p.m.	base	10
Evening late night	10:00 p.m. to 1:00 a.m.	early/late	15

2.4 Overview of Construction Approach

This section provides an overview of potential construction activities and timing. The overall period from start of construction to opening the light rail line would be about 7 years and include civil construction, systems installation, testing, and startup activities. The construction schedule calls for a period of civil construction during which site preparation, primary construction, and finish construction take place. Civil construction durations for the project would range from approximately 2 to 5 years in any given portion of the corridor. Activities would be most intense in the initial part of construction, with later years involving station and tunnel finishing, and systems installation.

The major construction activities that could cause environmental impacts are as follows:

- Demolition (buildings, pavement)
- Clearing and vegetation removal
- Fill and excavation
- Utility extensions, relocations, or disruptions
- Drainage changes
- Construction easements and staging area use
- Construction activity in or near a water body or sensitive area

- Tunneling, including spoils removal and transport
- Elevated structure construction
- Retaining wall construction
- Pile driving or auguring piles
- Blasting (not likely)
- Temporary partial or total road or lane closures and detour routes
- Temporary partial or limited access
- Building temporary vehicular and pedestrian detour routes
- Delivery of materials and equipment

The following subsections provide a brief description of the methods for each major construction component.

2.4.1 Construction Sequence and Activities

Construction of linear projects is typically divided into various segments or line sections based on similarities in configurations such as at-grade, elevated structures, tunnels, or retained-cut/fill sections. These segments or line sections may include underground stations, park-and-ride facilities, station platforms, transit centers, maintenance facilities, substation and signal control facilities, and other related improvements.

A work-specific construction plan would be developed during final design to establish the various construction phases and construction contracts, their estimated schedule and duration, and appropriate sequencing. Where possible, construction activities would be coordinated with other capital improvement projects being carried out by the local jurisdictions to help minimize construction impacts.

Typical construction for surface and elevated guideways and stations would occur on a 5- to 6-day work week schedule and would occur primarily between the hours of 7 a.m. and 10 p.m. In some locations (such as when street or freeway detours are involved and/or construction periods need to be abbreviated to reduce impacts), additional shifts, all-week, nighttime or 24-hour construction activities could be necessary. Tunneling contractors typically work extended periods when using large and expensive tunneling equipment. A typical operating regime is two 10-hour shifts each weekday with 4 hours overnight for maintenance and repair. Tunneling operations could take place 24 hours per day from 5 to 7 days per week.

Surface hauling operations do not need to be on the same daily working schedule as tunneling operations as long as there is sufficient spoils storage area in the construction staging areas. Excess excavated material would be removed and hauled to a permitted disposal site. Truck hauling would require a loading area, staging space for trucks awaiting loading, and provisions to prevent tracking soil on public streets. Truck haul routes would require approval by local jurisdictions. This would allow surface hauling activities to occur in off-peak periods if necessary, or to be concentrated during daytime periods to minimize potential impacts from noise on sensitive receptors such as residences or to avoid peak traffic periods. Vehicular and pedestrian access to existing businesses and residences would be maintained during construction as much as possible, and times of limited access would be coordinated with the business or resident. For example, it may be necessary to temporarily restrict access to pave a road or driveway.

Following excavation and completion of structures, the next phase of construction would include track work, at-grade system facilities, and other light rail-related facilities such as station platforms, park-and-ride lots, transit stations, and maintenance facilities.

2.4.2 Staging Areas and Construction Easements

Construction staging areas are needed before, during, and for a short time after construction work occurs. Staging areas would be used for construction, equipment storage, construction materials delivery and storage, demolition or spoils handling (in accordance with applicable regulations), contractor trailers, access roads, and construction crew parking. At-grade, elevated, and retained cut-and-fill line sections would have construction staging areas along the routes. Where roadway right-of-way does not already exist, generally a 60-foot to 100-foot total area (including the route right-of-way) is needed to construct the route. Contractors would generally use the property in which the facility is being constructed and property that has been acquired for right-of-way or other properties as negotiated by the contractor. Additional property may be required for contractor employee parking. Also, construction may require using one lane or even temporarily closing the road entirely for staging purposes.

Staging sites would be located throughout the project, but, because the Downtown Bellevue area is densely urbanized, Segment C staging areas have been identified in order to determine associated potential impacts. Furthermore, several Segment C alternatives involve tunneling, which requires approximately 4 to 6 acres immediately adjacent to each tunnel portal to support tunneling activities. In addition to the activities stated above, tunnel staging areas may include many of the following activities: stockpile, load, and haul tunnel spoils; receive and stockpile precast tunnel liners; assemble the tunnel boring machine and other boring/mining equipment; assemble slurry wall equipment, a shotcrete plant, or a concrete batch plant; and collect, store, and discharge construction water and groundwater. Following construction, staging sites may be redeveloped consistent with the current zoning. Exhibits 2-43 to 2-48 show the staging locations and construction methods for each alternative in Segment C.

Construction easements are temporary use of property during construction and would be required in numerous locations along the route. In undeveloped land areas, 50- to 100-foot easements would be necessary to maneuver equipment and materials along the corridor during construction. Where the project follows an existing transportation corridor, construction activities may require narrow temporary easements from adjacent properties. Following construction, easements would be returned to pre-construction condition.

For construction or staging purposes, using one lane or even temporarily closing the road entirely may be required. Where the project would partially or fully close streets, traffic would need to be rerouted via detours so construction can proceed in an efficient and timely manner while still maintaining access to existing businesses and residences. Traffic closures or detours would require approval by local jurisdictions and/or WSDOT.

2.4.3 At-Grade Light Rail Construction

Construction methods and impacts are similar to typical road construction. Utilities may be relocated first. Shallow, near-surface excavations would be required to construct the subgrade and track and station platform slabs for at-grade segments. Within road segments or paved areas, pavement would be removed first. In areas where access is not available from existing roads, a temporary construction road would be built. During the grading phase, the contractors would install culverts or other permanent drainage structures and below-grade light rail infrastructure. Underground utility work may require temporary steel plates in the roadway and temporary lane closures. Where in-street track is proposed within existing or expanded street right-of-way, grading would likely be minimal, but extensive reconstruction of streets, sidewalks, and other existing facilities may occur.

2.4.4 Elevated Light Rail Construction

Similar to construction of at-grade trackway, construction of elevated guideway would involve demolition, clearing, grading, relocating utilities, and preparing necessary construction access. A temporary construction road would be built where constructing an elevated guideway in undeveloped areas or where access is not available from existing roads (primarily in parts of Segments B and D). An elevated guideway can have vegetation under and around it, although there is a tree-clear zone within 20 feet of the structure itself. Constructing an elevated guideway within existing street right-of-way may temporarily close some traffic lanes and detour traffic.

Elevated guideways and stations for light rail, similar to structures such as highway bridges, are generally reinforced concrete, steel, or combinations of both. Construction would begin with preparation work to build foundations that may consist of shallow spread footings, deep-driven augured piles, or drilled shafts. Once foundations are in place, concrete columns would be constructed. The elevated superstructure may be steel, cast-in-place concrete, pre-cast concrete, or segmental. If steel and/or cast-in-place concrete is used, false-work would be required to support the superstructure while the cast concrete gains enough strength during curing to support itself or while the steel beams are joined through welding or bolting. If the elevated guideway is close to or within the roadway, the false-work would require temporary lane closures and traffic detours until a sufficient portion of the elevated structure is complete. Segmental construction can be built without false-work between the columns. Some short-term, partial to full street closures may be required to accommodate segmental construction activities.

2.4.5 Below-Grade Light Rail Construction

Tunnel and underground station construction may include cut-and-cover, tunnel-boring, and/or sequential excavation mining methods. Exhibits 2-43 to 2-45 illustrate which technique is planned for each of the tunnel alternatives. In general, cut-and-cover techniques would be used for all stations, where tunnels are too short to justify boring, where tunnel depths are shallow, and where tunneling may encounter soil nails or tie-backs from adjacent underground parking garages and deep building foundations.

Tunneling areas could require some form of soil stabilization ahead of tunneling operations. Methods

EXHIBIT 2-43
Staging Areas and Construction Methods for C1T, Bellevue Way Tunnel

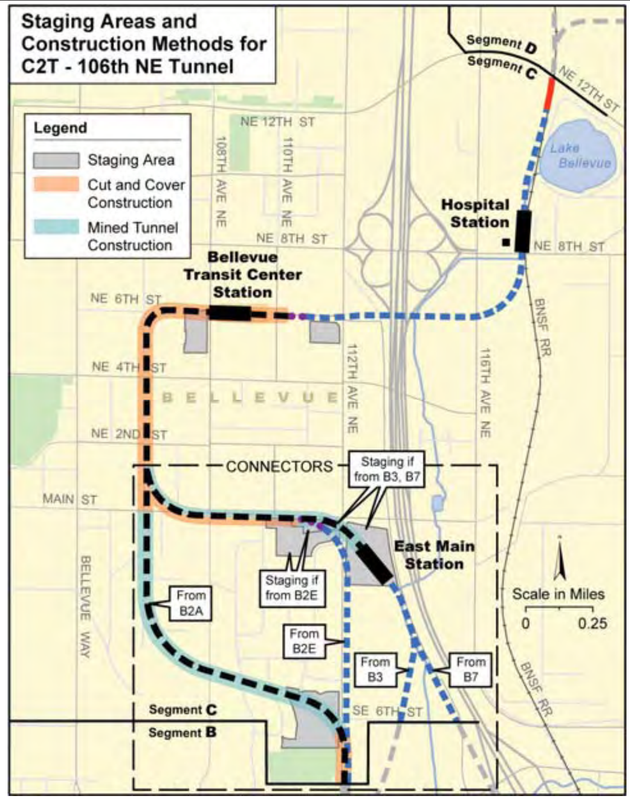


EXHIBIT 2-44
Staging Areas and Construction Methods for C2T, 106th NE Tunnel

EXHIBIT 2-45
Staging Areas and Construction Methods for C3T, 108th NE Tunnel

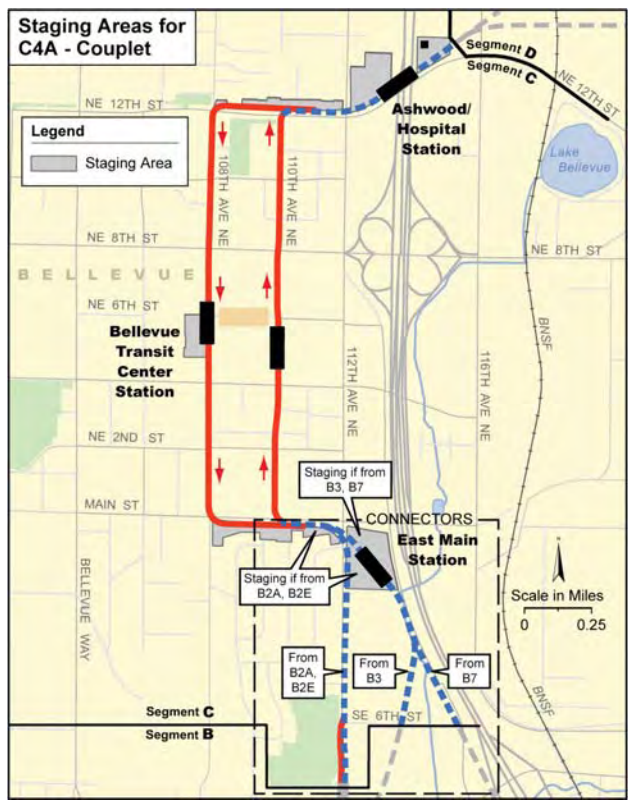


EXHIBIT 2-46
Staging Areas and Construction Methods for C4A, Couplet

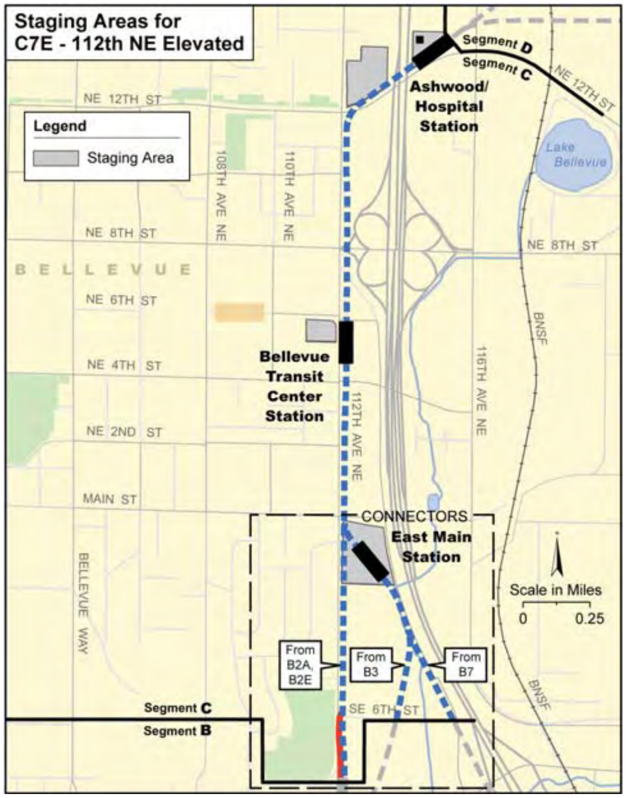


EXHIBIT 2-47
Staging Areas and Construction for C7E, 112th NE Elevated

EXHIBIT 2-48
Staging Areas and Construction Methods for C8E, 110th NE Elevated

used could be jet grouting, ground freezing, rock displacement, or a combination of these methods.

These methods are often performed from the surface. Operations entail grout storage, grout mixing, clean-up facilities, noise suppression enclosures, and other environmental considerations. Mining is done through two techniques: using a tunnel boring machine or sequential excavation.

Mined construction begins with construction of an access portal. On hillsides, the access portal can be dug directly into the hillside (using the cut-and-cover method). In flatter areas, an access shaft must first be excavated. Once a portal or shaft is dug, the mining equipment, such as a tunnel boring machine, can begin excavating earth. The resulting excavated materials (spoils) are transported to the shaft or portal for stockpiling and/or hauling.

The type of tunnel boring machine used depends on geological conditions. Some tunnel boring machines are supported by a small supply train that brings in materials and takes out the excavated spoils. Conveyors or pipes can also be used to bring out the spoils, depending on the machine type.

Sequential excavation mining consists of the excavation of a tunnel by many smaller but defined steps. This technique can use conventional excavation equipment or a rapid excavation machine rather than a tunnel boring machine. Sequential excavation is slower and more expensive than using a boring machine.

The need for fresh air requires that a mechanical ventilation system and fans be in place during mined construction. Fans may run for 24 hours a day and could be audible at tunnel portals, stations, or access locations.

Cut-and-cover stations (and cut-and-cover tunnel segments) would be excavated from the surface and are essentially large retained cuts. Utilities must be temporarily or permanently diverted or supported across the excavation. The excavation can be decked over at the street level to allow traffic to continue once the excavation is deep enough (10 to 15 feet) to allow earthmoving equipment below. Openings in the decking or bridge are needed to allow removal of the excavated material. Cut-and-cover work also requires backfill following tunnel construction. This work requires the use of imported material or suitable material from the excavation.

For underground construction, it is often necessary to install dewatering facilities. Dewatering can be accomplished by a number of general mechanical methods including sumps, pumps, and dewatering wells. These systems require that water generally be pumped to the surface and discharged, or stored, or recharged into the ground. Discharge would follow the National Pollution Discharge Elimination System (NPDES) regulations through the Washington State Department of Ecology (Ecology).

2.5 Environmental Commitments

Sound Transit is committed to satisfying all applicable federal, state, and local environmental regulations and to responsibly and reasonably mitigate significant adverse environmental project impacts consistent with Sound Transit policies and applicable regulations. This Draft EIS identifies measures to mitigate impacts of the project alternatives. Mitigation measures committed as part of the project are identified along with other potential measures that would reduce or eliminate impacts. Mitigation measures would be refined through final design and permitting. The Record of Decision (ROD) for East Link would be issued after the Final EIS and would include a list of committed mitigation measures for the project to be built.

In addition to meeting environmental commitments, Sound Transit would continue to avoid and minimize impacts where possible. Adjustments have been made during conceptual design to avoid or minimize impacts. Following the identification of alternatives for study in this EIS, four community workshops were held to receive input from community members and stakeholders and hear their concerns about the alternatives so that designs might be made sensitive to community facilities. In addition, as environmental impact information was developed, it informed the alternative designs. Minimization and avoidance measures have been considered for all elements of the environment in the EIS. Where impacts could not be avoided at this stage of design, the environmental analysis includes potential mitigation measure to reduce the overall impacts (see Chapter 3, Transportation Environment and Consequences, and Chapter 4, Affected Environment and Environmental Consequences). The alternatives refinement process would continue through final design.

2.6 Estimated Project Costs and Funding

The current level of project design includes uncertainties regarding the project scope, engineering data, mitigation requirements, schedule, and project delivery methods. Therefore, the project cost estimates at this stage are conceptual costs. These estimates focus on the project elements that are defined consistently across alternatives, that capture the essential physical features of alternatives, and that help distinguish alternatives from one another. The project costs include the following cost elements:

- Construction costs for facilities, including the trackway/guideway, stations, maintenance facilities and associated improvements, and anticipated mitigation requirements
- Contingencies that address the varying levels of uncertainty and construction risk that have been identified for alternatives
- Right-of-way acquisition costs, including tunnel and temporary construction easements

In addition, cost estimates for design, permitting, agency administration, program management, construction change orders, and unallocated contingency were estimated as a percentage of the above estimates. Finally, an additional allocation for project reserve, a provision for change orders, and other unforeseeable cost changes was also included in the project cost estimates. The costs estimates support the Sound Transit Board's evaluation of the relative cost of the alternatives defined in the Draft EIS.

The East Link Project would be a composite of one alternative from each segment. Exhibit 2-49 shows the cost range of the overall project, where the high cost

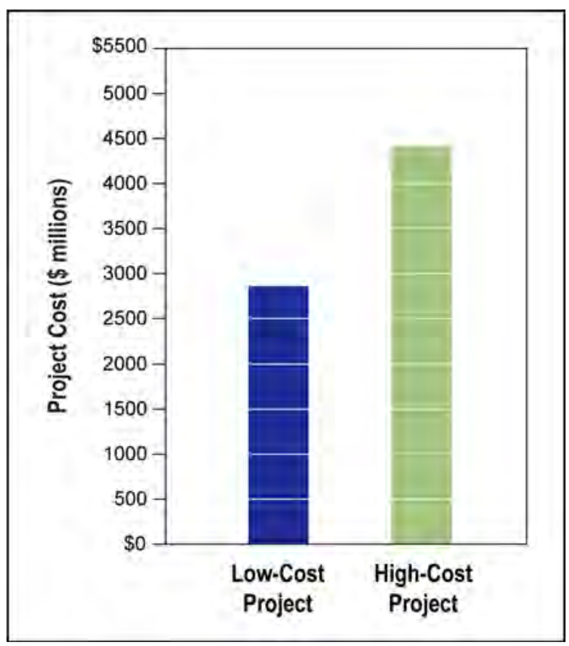


EXHIBIT 2-49
Overall Project Cost Range

includes a tunnel alternative in Segment C, Downtown Bellevue and the low cost includes an elevated alternative in Downtown Bellevue. If the project were only built to the Hospital or Ashwood/Hospital Station (east end of Segment C), the high project cost would be just under $3 billion, whereas the low cost project would be just under $2 billion. Ending at the Overlake Transit Center – the east most station of Segment D, the high cost project would increase to a total of about $3.7 billion, as compared to the low project cost of about $2.3 Billion to the Overlake Transit Center. Other factors influencing the cost range include whether both the 124th and the 136th stations are built and whether the route is primarily at-grade or elevated. The cost estimates by segment are presented in Section 2.6.2 following funding, which is discussed in Section 2.6.1.

2.6.1 Funding

Sound Transit regional transit programs are typically funded through a combination of voter-approved tax initiatives, FTA grants, issuing bonds, and fare box income. Sound Transit projects are in large part funded through taxes collected in a three-county district. The East Link Light Rail Transit Project is included in Sound Transit 2: A Mass Transit Guide, The Regional Transit System Plan for Central Puget Sound (ST2), which was adopted by the Sound Transit Board on July 24, 2008. The ST2 Plan funds construction and operation of the portion of the East Link project from Seattle to the Overlake Transit Center Station (Segments A through D). ST2 provides funding for an at-grade or elevated alternative through downtown Bellevue (Segment C). If the Sound Transit Board selects a tunnel alternative in this segment, additional funding sources would be required. Environmental review and preliminary engineering are funded for Segment E from the Overlake Transit Center Station to downtown Redmond. Funding for a maintenance facility is not included in ST2. A proposition known as the Mass Transit Expansion proposal authorizing Sound Transit to impose an additional five-tenths of one percent sales and use tax and use existing taxes to fund the local share of the ST2 Plan was approved by the voters in November 2008.

The Sound Transit District has five designated subareas: Snohomish County, North King County, South King County, East King County, and Pierce County. According to current Sound Transit policy, revenues from taxes collected in each of the five subareas must generally be spent for projects and services that benefit the local subarea providing the funding. The project would use revenues from the North King County and East King County subareas. The Rainier Station would be funded from revenues from North King County, and funding for the remainder of the project would come from the East King County Subarea.

2.6.2 Project Cost Estimates

Once the Sound Transit Board identifies the preferred alternative, Sound Transit will complete preliminary engineering for that alternative, which will then be used to prepare a more detailed cost estimate. This information will be presented in the Final EIS and used to develop a financial plan for the project and to determine project phasing.

The following subsections describe the range of cost estimates by segment to help compare alternatives that serve similar ridership markets.

2.6.2.1 Segment A

The cost estimates for the East Link Project assume that completion of the I–90 Two Way Transit and HOV Operations Project would be funded separately. The I-90 Alternative (A1) is located exclusively within WSDOT and City of Seattle rights-of-way. The range for Segment A falls between $730 and $750 million (Exhibit 2-50). The cost for the project to use the I-90 center roadway has yet to be determined and is subject to negotiations with WSDOT.

The two design options to have either joint use of light rail and buses or exclusive light rail operation on the D2 Roadway HOV ramp would vary the costs for Segment A. Joint operation would cost $16 million to $18 million more than exclusive operation. The only other consideration for A1 is a possible pedestrian bridge to the Mercer Island Station instead of access off 77th Avenue SE. The pedestrian bridge option would require approximately $6 million more than the station option with access from 77th Avenue SE.

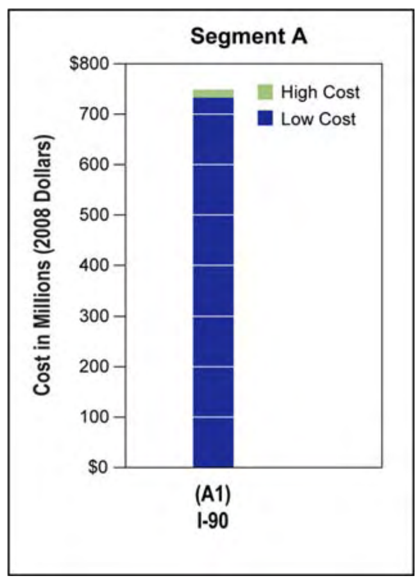


EXHIBIT 2-50
Cost Estimate – Segment A

2.6.2.2 Segment B

The cost of the Segment B alternatives ranges from approximately $420 to $550 million (Exhibit 2-51). The Bellevue Way Alternative (B1) has the lowest cost, primarily because it is uniquely at-grade, whereas all other alternatives include at least some elevated profile. However, Alternative B1 only connects with Alternative C1, which is the most expensive alternative in Segment C. The other Segment B alternatives connect to the other at-grade, elevated, and tunnel alternatives in Downtown Bellevue. Further discussion of the costs of the various combinations between Segment B and C alternatives follows the Segment C cost comparison discussion.

Alternative B1 would exit the I–90 center roadway at-grade on the HOV off-ramp, whereas all other Segment B alternatives include a new elevated light rail structure to exit I-90 that preserves HOV access from Bellevue Way SE to westbound I-90. Alternatives B2A, B2E, and B3 continue on elevated structure to north of the South Bellevue Station and park-and-ride. The elevated exit from I-90 costs approximately $40 million more than the at-grade alternative and remaining elevated until north of the South Bellevue Station adds approximately $25 million in guideway cost and $40 million in station cost.

The 112th SE At-Grade Alternative (B2A) is the next lowest cost alternative (between $11 million and $45 million lower than other alternatives) in Segment B. The higher cost alternatives have more elevated guideway profile costs. Although at-grade alternatives have lower light rail structure costs than elevated alternatives, they generally incur higher street reconstruction and utility relocation costs. While the BNSF Alternative (B7) uses a portion of BNSF Railway right-of-way, it is somewhat longer than the other Segment B alternatives. The cost estimate assumes replacement of the existing railroad with new trackway for exclusive light rail use.

2.6.2.3 Segment C

Segment C alternatives range from $600 to $1,615 million. Segment C alternative cost estimates have the greatest cost range among the alternatives due to the inclusion of at-grade, elevated, and tunnel profiles (Exhibit 2-52). The most costly profile is a tunnel. The at-grade and elevated alternatives have similar costs. The lowest cost alternative is 112th NE Elevated Alternative (C7E) because it is the shortest route and is primarily side-running, thereby minimizing street modification costs.

The cost range within each alternative is related to the connections from Segment B. The Bellevue Way Tunnel Alternative (C1T) has only one connection from Segment B—to the Bellevue Way Alternative (B1)—and therefore has no range in project costs and

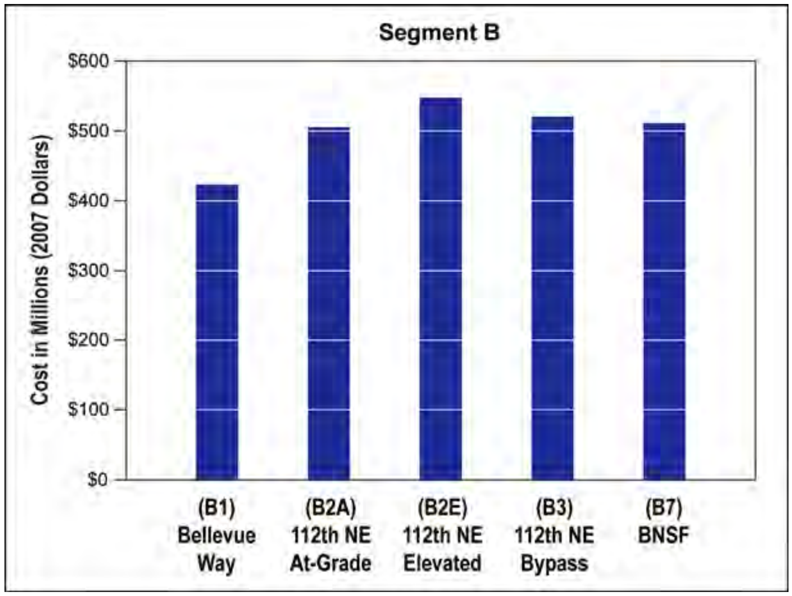


EXHIBIT 2-51
Cost Estimate – Segment B

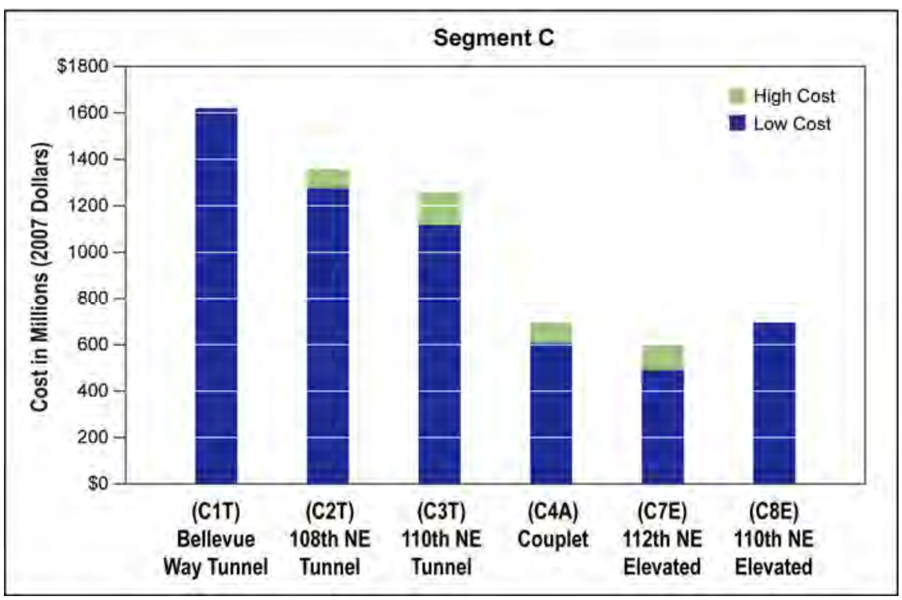


EXHIBIT 2-52
Cost Estimate – Segment C

remains the highest cost alternative in Segment C. The 110th NE Elevated Alternative (C8E) connects only to the 112th SE Bypass (B3) and BNSF (B7) alternatives. The alternative connecting from B3 would cost less than $1 million more than connecting from B7.

Generally, the Segment C alternatives cost less when connecting from the 112th Elevated Alternative (B2E). The exception is the B3 connector for the 106th NE Tunnel Alternative (C2T). For both the C2T and 108th NE Tunnel (C3T) alternatives, the B2A tunnel connection through the King County District Court House site is the most costly (between $83 and $138 million more than the least costly connector). For the Couplet (C4A) and 112th NE Elevated (C7E) alternatives, the connector from 112th At-Grade (B2A) adds between $16 and $24 million more than B2E, and the connectors from B3 and B7 add as much as $92 to $100 million more to the alternative cost.

In addition, there are two options for the Ashwood/Hospital Station, either over I-405 (for the 108th NE Tunnel [C3T], Couplet [C4A], and 110th NE Elevated [C8E] alternatives) or east of I-405 for the 112th NE Elevated Alternative (C7E). The less expensive of the two is the station east of I-405. The station located over I-405 includes an additional 25 percent cost ($12 million) for construction over I-405.

As shown in Table 2-6, the total cost of combining Segment B with Segment C alternatives provides another cost comparison. Some of the cost savings in Segment B are lost when connecting to Segment C. For instance, the range in Segment B alternatives shows almost no difference in cost among the combinations with Alternative C2T options. And while Alternative B2A appears to be generally a low-cost alternative, in combination with C3T and C4A, the total costs exceed other combinations of Segment C and B alternatives. Conversely, Alternative B2E combinations with C3T and C4A are the lowest cost, with a difference of $60 million to $100 million.

2.6.2.4 Segment D

The Segment D alternatives range from approximately $530 to $870 million (Exhibit 2-53). There is relatively little difference in cost among Segment D alternatives aside from the SR 520 Alternative (D5), which is lower because it avoids the construction of two stations: the 124th and 130th stations. NE 16th At-Grade Alternative (D2A) is somewhat lower in cost than the remaining alternatives because an at-grade profile can be less expensive than elevated and retained-cut profiles.

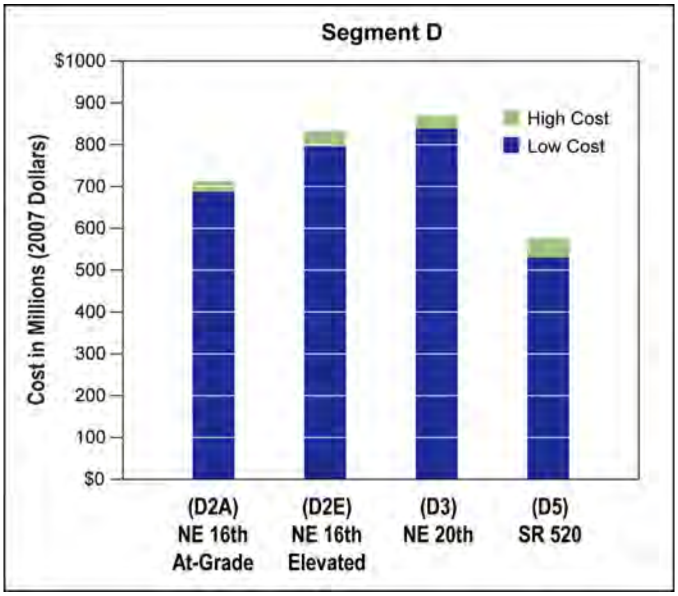


EXHIBIT 2-53
Cost Estimate – Segment D

TABLE 2-6
Total Costs of Combining Segment B and Segment C Alternatives[a] ($Millions, 2007 dollars)

	B1, Bellevue Way ($420)	B2A, 112th SE At-Grade ($500)	B2E, 112th SE Elevated ($550)	B3, 112th SE Bypass ($520)	B7, BNSF ($510)
C1T, Bellevue Way Tunnel ($1,610)	$2,040	N/A[b]	N/A[b]	N/A[b]	N/A[b]
C2T, 106th Tunnel ($1,280 to $1,360)	N/A[b]	$1,860	$1,840	$1,800	$1,800
C3T, 108th Tunnel ($1,120 to $1,260)	N/A[b]	$1,760	$1,670	$1,700	$1,710
C4A, Couplet ($610 to $700)	N/A[b]	$1,130	$1,160	$1,220	$1,210
C7E, 112th NE Elevated ($500 to $600)	N/A[b]	$1,030	$1,050	$1,120	$1,110
C8E, 110th NE Elevated ($700)	N/A[b]	N/A[b]	N/A[b]	$1,220	$1,120

[a] Costs in millions of dollars.
[b] N/A = no combination between alternatives planned.

For the connection options to Segment C, property acquisition is the primary factor in the cost difference between the NE 12th Street connector (from C3T, C4A, C7E, C8E) versus the BNSF Railway connector (From C1T and C2T). The BNSF Railway connector would cost up to 7 percent more than the NE 12th Street connector for all Segment D alternatives except for the SR 520 Alternative (D5), for which the BNSF connector would be as much as 5 percent less than the NE 12th Street connector. The SR 520 Alternative (D5) also has two design options on the east end of Segment D, which account for less than a $3 million difference in the estimate.

For the alternatives following NE 16th Street, either one or both of the 124th and 130th Stations may be built. For the NE 16th At-Grade Alternative (D2A) and the NE 20th Alternative (D3), a single station rather than both stations would reduce the overall project costs by almost $11 million. For the NE 16th Elevated Alternative (D2E), the cost reduction would be approximately $47 million because an elevated station is more costly.

2.6.2.5 Segment E

Segment E alternatives range from $570 million to $790 million, with the Marymoor Alternative (E2) having either the highest or the lowest cost depending on whether the Redmond Transit Center Station is built or not. The Segment E alternatives have many portions of their routes in common. The differences lie in how they serve Downtown Redmond. The full-length Marymoor Alternative (E2) is the most expensive alternative because it has the longest route with an additional station and is the only alternative with right-of-way costs along 161st Avenue NE. However, if the shorter version is selected, then E2 and the Leary Way Alternative (E4) are both somewhat equal in being the lowest cost alternatives. One important design option is where all alternatives cross the SR 520/SR 202 interchange and Bear Creek. Redmond Way Alternative (E1) is elevated over both Bear Creek and the SR 520/SR 202 interchange. This option is approximately $11 million more than passing under the SR 520/SR 202 interchange in a retained cut, then crossing over Bear Creek, as the other two alternatives do. The range in Segment E costs is shown in Exhibit 2-54.

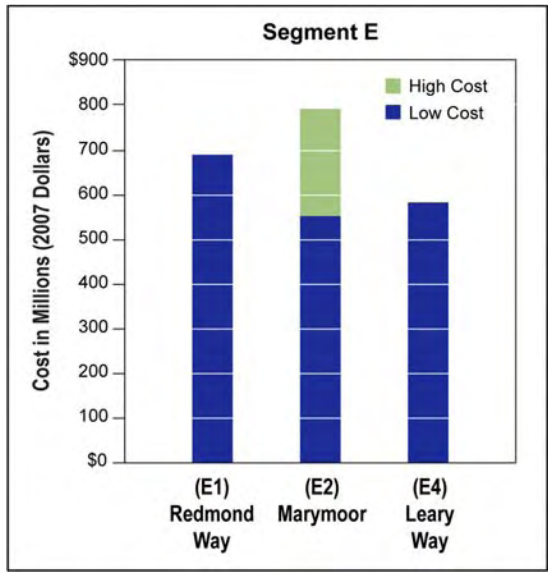


EXHIBIT 2-54
Cost Estimate – Segment E

2.6.2.6 Maintenance Facilities

The 116th Maintenance Facility (MF1) would be the most expensive alternative due to the amount of excavation required to create a level site, ranging from approximately $430 to $460 million. The variation of cost for the maintenance facility is influenced by the alternative connections. Simply stated, the longer the access track from the alternative to the maintenance facility, the higher the associated costs. The BNSF Maintenance Facility (MF2), at approximately $310 million, and the SE Redmond Maintenance Facility (MF5), between $240 and $280 million, would be the lowest cost alternatives due to lower site development costs, with MF5 the least expensive due to slightly lower right-of-way costs. The SR 520 Maintenance Facility (MF3) would have higher site development costs than either MF2 or MF5, but lower costs than MF1. MF1 and MF3 would be the least expensive for the SR 520 Alternative (D5) connection, whereas MF2 would be slightly less expensive for all other Segment D alternatives. MF5 would have the lowest cost with connection from the Redmond Way Alternative (E1).

The range in maintenance facility costs is shown in Exhibit 2-55.

2.6.2.7 Operating and Maintenance Costs

Operating and maintenance costs for the East Link project were estimated based on the estimates developed for the ST2 plan adopted in July 2008. East Link operating costs are the annual system operating costs for the completed light rail system in the ST2 Plan as allocated to the East Link extension from Seattle. The light rail system operating costs are based on a labor build-up model of a type used for FTA New Starts cost estimates; it was calibrated to the relatively well-established operating and maintenance costs for the Link Initial Segment under the existing agreements with King County.

The major determinants of operating costs are service levels, running time, and trackway profile. The more frequent the service and the longer the line, the more vehicles it takes to maintain equivalent headways. Shorter alternatives with fewer stations have lower operating costs. In terms of line and station maintenance, at-grade is the lowest cost, elevated the next highest, and tunnels the highest.

The ST2 Plan allocated annual operating costs for the East Link alternatives from Seattle to the Overlake Transit Center Station is estimated at $25 million (2007$) based on ridership for 2030 (ST2 Plan Appendix C). Based on this, an additional $6 million annual operating cost is estimated for Segment E, which extends from Overlake Transit Center Station to downtown Redmond. The total estimated annual operating cost for the entire East Link project from Seattle to downtown Redmond would be approximately $31 million. These estimates will be refined as the project definition evolves and detailed operating plans are developed.

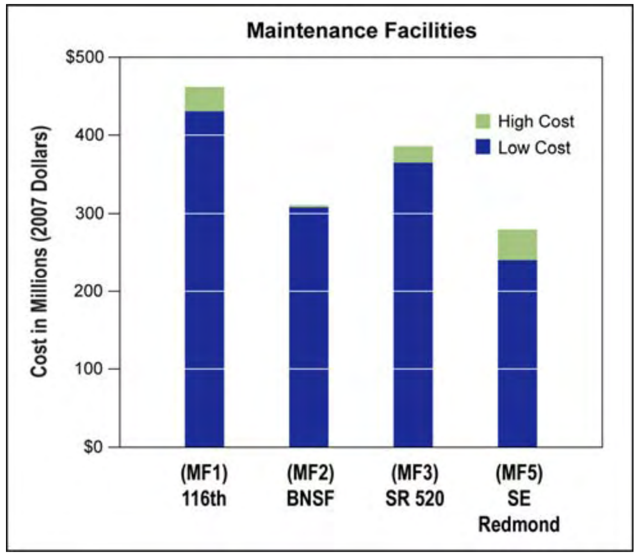


EXHIBIT 2-55
Cost Estimate – Maintenance Facilities

2.7 Next Steps and Schedule

2.7.1 Draft EIS Review and Comment Process

Sound Transit, WSDOT, and FTA are widely circulating the Draft EIS to affected local jurisdictions, state and federal agencies, tribes, community organizations, other interest groups, and interested individuals. The document is also available at Sound Transit offices, public libraries, and community centers. Those who wish to review and/or comment are provided a formal public comment period following the date of issuance of the document. In addition, public hearings will be held during the comment period to receive oral testimony. Please see the Fact Sheet at the beginning of this document for details.

2.7.2 Identification of Preferred Alternative

It is anticipated that the Sound Transit Board will identify a preferred alternative after the board considers the information in the Draft EIS, public and agency comments from the Draft EIS comment period, and other relevant information. The board will not make a final decision on the project alternative to be implemented until after the Final EIS is issued. The preferred alternative is called a "locally preferred alternative" by FTA to make clear that the federal government has not made a decision until it issues a Record of Decision (ROD) after completion of the Final EIS.

2.7.3 Final EIS and Project Decision

After circulation of the Draft EIS and consideration of comments received, Sound Transit, WSDOT, and FTA will prepare the Final EIS. The Final EIS will document and address comments received on the Draft EIS. It will also describe the preferred alternative and proposed mitigation commitments associated with the East Link Project. Following completion of the Final EIS, the Sound Transit Board will make a final decision on the project alternative, amending or confirming its previous identification of the preferred alternative. FTA's decision under NEPA is not final until it certifies the ROD on the Final EIS.

2.7.4 Federal Approval

FTA will issue a decision document referred to as the federal ROD. The ROD states FTA's decision on the project, identifies the alternatives considered by FTA in reaching its decision, and itemizes Sound Transit's commitments to mitigate project impacts. Issuance of the ROD is a prerequisite for any federal funding or approvals.

2.7.5 Project Schedule

Table 2-7 shows the anticipated schedule milestones if the East Link Project is funded. The length of the project would depend on available funds and construction costs.

The East Link Light Rail Transit Project is included in the ST2 Plan, which was approved by the voters in November 2008. The ST2 Plan funds construction and operation of the portion of the East Link project from Seattle to the Overlake Transit Center.

The schedule for final design, construction, and operation will be refined as the project moves closer to the end of the environmental review and preliminary design phase. ST2 envisions that service would be provided to Bellevue by 2020 and Overlake by 2021.

TABLE 2-7
Project Milestone Schedule

Preliminary Design and Environmental Review	
Draft EIS published	December 2008
Draft EIS comment period	75 days
Sound Transit Board identifies preferred alternative	Spring 2009
Final EIS published	Summer 2010
Sound Transit Board selects project to be built	Summer 2010
Federal Record of Decision	Summer 2010
Final Design, Construction, and Operation	
Final Design	2011 - 2013
Construction	
• Seattle to Bellevue • Bellevue to Overlake	2013 - 2019 2014 - 2020
Start of Service	
• Seattle to Bellevue • Bellevue to Overlake	2020 2021

2.7.6 Benefits and Disadvantages of Delaying Project Implementation

As required by SEPA (WAC 197-11-440(5)(c)), this section discusses the benefits and disadvantages of reserving for some future time the implementation of the proposed project, as compared with possible approval at this time. The Draft EIS provides an opportunity to address unresolved issues. In addition, Sound Transit and federal actions subsequent to the Final EIS provide additional forums to address outstanding issues.

The primary benefit to delaying the project would be to postpone impacts associated with project construction. Also, during project delays, development in the project vicinity could either preclude aspects of the project or better accommodate the project.

There are several disadvantages of delaying implementation of all or part of the project. The primary disadvantage of delaying the project would be the inability to realize a major component of the region's long-range plans for managing growth and transportation, and the benefits that result from those plans, such as more compact development and a reduction in greenhouse gas emissions. PSRC and Sound Transit have studied many times the increasing congestion in the cross-lake corridor and determined that light rail to the Eastside is needed. In anticipation, local jurisdictions are meeting land use density objectives established in the regional *Destination 2030*, which established long-range growth management, economic, and transportation strategies. Bellevue and Redmond have adopted transit oriented development plans in the Bel-Red and Overlake corridor in anticipation of East Link. They have conducted feasibility studies that indicate the market forces that support dense, mixed-use development. Delays to East Link could change development patterns, leading to less dense development and lost opportunity. A substantial delay in implementing East Link would inhibit the ability of the region to accommodate growth as planned.

Implementing the East Link Project would increase person capacity on I–90 and reduce travel time during peak hours, particularly in the reverse peak direction.

This would provide a benefit not only to the overall performance and mobility of I-90 but also to the key urban centers of Seattle, Bellevue, Overlake, and Redmond. If this project is delayed, this benefit would not be realized nor would the associated benefits of improved freight movement, reduced pollutants affecting air quality and global climate change, and the overall reduction of energy consumption used by travelers between Seattle and Redmond. Delays would limit economic development as influenced by the movement of people and goods and lost opportunity of linking neighborhoods and the primary Puget Sound regional employment centers.

The potential funding implications associated with delaying the project could result in delays in project construction, which would result in higher construction costs due to inflation in future years. Delays would be likely to increase overall project and right-of-way costs. If an interim terminus is built but the rest of the project is delayed, impacts at the terminus station could increase, and costs for the overall project could increase. However, delaying all portions of the project until the entire project could be funded would delay the transportation improvements and other benefits that would be provided by that first interim segment.